# ENGINEERING NEWS-RECORD

A special report on

*Annual*

# SURVEY OF COSTS.. AND TRENDS

A McGRAW-HILL PUBLICATION

# They stopped a flood on dry land

Flooded subgrades often caused heavy maintenance expense on highways, airports and railways, even when the surface was dry as a bone.

To remove this excess water permanently and economically Armco engineers developed HEL-COR Perforated Pipe.

Made on automatic machines, this pipe meets all the needs of a first class subdrainage system. It is low in cost, easy to handle, and durable. It has ample corrugated metal strength to withstand shifting soils, frost action or the impact and vibration of heavy loads. Scientifically placed holes collect unwanted water, which is drained off along the pipe invert. Subgrades become dry and stable; maintenance costs go down.

Providing better products to meet specific needs has been standard practice at Armco for more than 40 years. A few examples are Spiral Welded Pipe, FLEX-BEAM Guardrail, STEELOX Buildings and MULTI-PLATE Bridges.

Today you can bring your drainage and construction problems to Armco with full assurance that you will receive all the benefits of long experience, extensive research facilities and a real interest in helping you solve these problems.

Armco has a complete range of engineered products and convenient, authoritative data to help you. If your problem is difficult or unusual, why not talk it over with us.

ARMCO

**ARMCO DRAINAGE & METAL PRODUCTS, INC.**

MIDDLETOWN, OHIO • OFFICES AND PLANTS IN PRINCIPAL CITIES
SUBSIDIARY OF ARMCO STEEL CORPORATION

Berkeley, California ★ Middletown, Ohio ★ South Bend, Indiana ★ Baltimore, Maryland
Denver, Colo. ★ Des Moines, Iowa ★ Atlanta, Ga. ★ Topeka, Kansas ★ Houston, Texas
Minneapolis, Minnesota ★ Portland, Oregon ★ Washington, D. C. ★ [illegible]

# B.F. Goodrich

## The tire that thrives on a diet of mud and razor-sharp rocks

TIRES hauling ore-bearing clay from pit to mill in barite mining service lead a difficult life. The tires on the equipment shown being examined above, operated by the Baroid Sales Division of the National Lead Company, Potosi, Mo., have been working under the following routine:

One minute they are backing out on raw clay in the pits — a clay that has the consistency of putty when moist, but like rough stone when dry. Next, they are carrying a twelve-ton load to the mill over a road of flint and quartz — a surface similar to broken razor blades.

Yet, the operators report they have experienced *no road delays due to tire trouble* since B. F. Goodrich tires were put into service in 1947. This big cut in operating costs is largely due to the exclusive protection of the patented *nylon shock shield* found only in B. F. Goodrich tires (with *double* nylon shock shield in larger sizes). Layers of nylon cord, built between the tread and body plies, shield the cord body by smoothly distributing shocks and strains.

These BFG tires have a special deep tread designed for just such service. The BFG Rock tires shown above have wide, continuous-running ribs that give more wear at vital points. The heavy, non-directional cleats on the shoulders give a deep bite in forward or reverse, on moist clay or hard quartz. And the tread material is compounded to resist cutting.

Regardless of the type of tire service your equipment demands, your B. F. Goodrich retailer has a cost-cutting answer. See him and be sure to specify BFG tires for your new equipment. Enjoy the extra savings of patented nylon shock shield protection at no extra cost. *The B. F. Goodrich Company, Akron, Ohio.*

RESEARCH KEEPS
B.F. Goodrich
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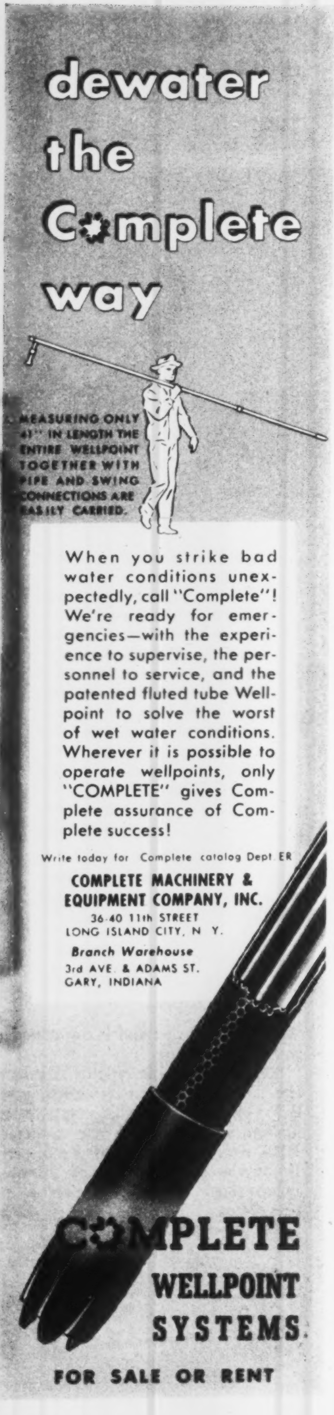

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# ENGINEERING NEWS-RECORD

Member

VOLUME 146 MARCH 29, 1951 No. 13

WALDO G. BOWMAN
**Editor**

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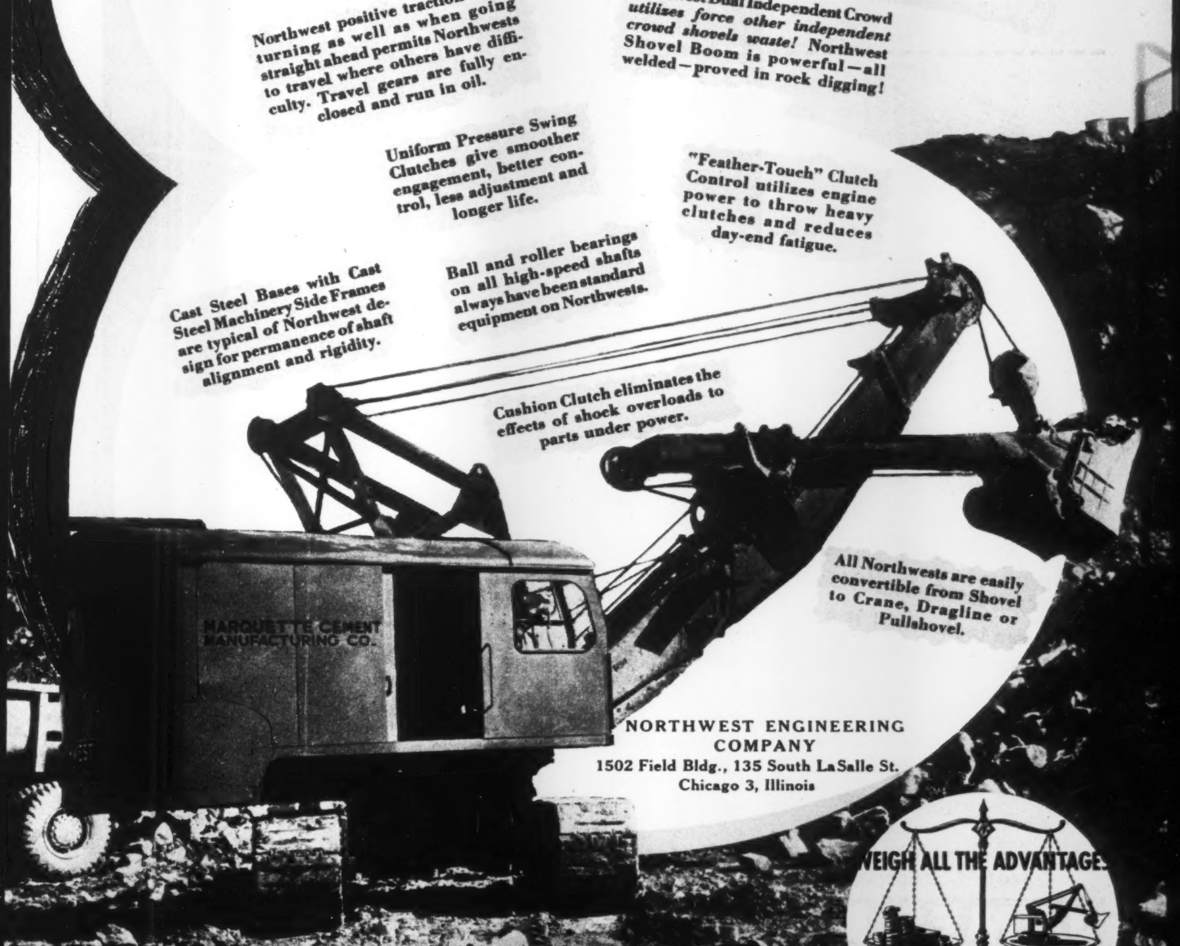

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Northwest positive traction while turning as well as when going straight ahead permits Northwests to travel where others have difficulty. Travel gears are fully enclosed and run in oil.

Northwest Dual Independent Crowd *utilizes force other independent crowd shovels waste!* Northwest Shovel Boom is powerful—all welded—proved in rock digging!

Uniform Pressure Swing Clutches give smoother engagement, better control, less adjustment and longer life.

"Feather-Touch" Clutch Control utilizes engine power to throw heavy clutches and reduces day-end fatigue.

Cast Steel Bases with Cast Steel Machinery Side Frames are typical of Northwest design for permanence of shaft alignment and rigidity.

Ball and roller bearings on all high-speed shafts always have been standard equipment on Northwests.

Cushion Clutch eliminates the effects of shock overloads to parts under power.

All Northwests are easily convertible from Shovel to Crane, Dragline or Pullshovel.

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COMPANY
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WEIGH ALL THE ADVANTAGES

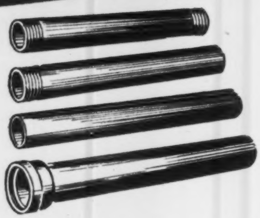
WHETHER SHOVEL, CRANE, DRAGLINE,
PULLSHOVEL or TRUCK CRANE
*a star on every job!*

NORTHWEST

CRAWLER and TRUCK MOUNTED SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

Master Plumbers Know These Outstanding Advantages and Install ...

# CLOW (IPS)* Cast Iron Pipe

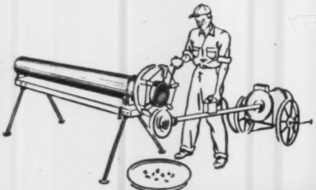


## FOR All 3-inch and larger WASTE, VENT AND DRAINAGE LINES

Clow "IPS" Cast Iron Pipe is used for all types of construction for waste lines and vent stacks, for draining rainwater from roof areas, and for long runs of suspended sewer handling water-borne waste (hot or cold) from plant or laboratory operations, etc.

## FOR A CENTURY OR MORE OF SERVICE

When you install Clow "IPS" Cast Iron Pipe for drain lines inside or outside of buildings—imbedded in walls or exposed, you're making an installation that will last through a century and more of service.



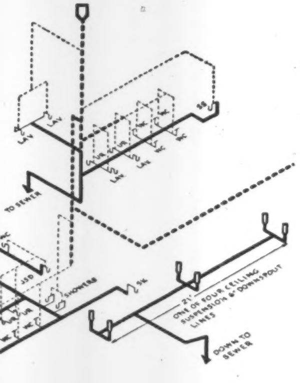
## FOR SPEEDY FABRICATION

Clow "IPS" Cast Iron Pipe can be cut, threaded and fitted on the job, with ordinary tools of the piping trade. Available with plain or threaded ends, in 3, 4, 5, 6, 8 and 10" sizes in 18' random lengths. Also furnished with integral caulking hub on one end (other end plain) in 18' random lengths in 4, 6 and 8" sizes.

*"IPS" is Iron Pipe size O. D.

For Your Information a Typical Case History

Shown to the right is a section from the plumbing blueprint of a university's research laboratory, with Clow "IPS" (threaded) Cast Iron Pipe indicated most prominently. "IPS" pipe was chosen because of its time saving economy of fewer caulked joints on long runs of piping. Perhaps this diagram may suggest possible uses of Clow "IPS" Cast Iron Pipe for similar jobs on your schedule.



*For complete information write for illustrated, descriptive literature TODAY.*

**JAMES B. CLOW & SONS**

201-299 North Talman Avenue • Chicago 80, Illinois

and their National Cast Iron Pipe Division, Birmingham, Alabama;
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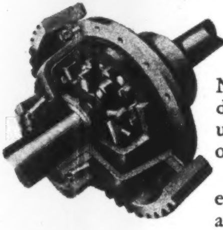
# Macks ARE Masters

## OF THE TOUGHEST TERRAIN



No matter how tough the going . . . under the worst of weather conditions . . . through slippery mire or shifting sand . . . or over rutted, uneven ground — big SUPER MACK trucks keep the payloads moving on time . . . at less cost and with less absenteeism.

One big reason why Mack trucks lick the toughest terrain is the exclusive Mack Power Divider. Where unequal tractive requirements are encountered, the Power Divider differential distributes torque to favor the driving wheel having the most traction, thus eliminating power dissipation in useless wheel slippage.

Mack's exclusive Power Divider combines with numerous other outstanding Mack features to give you the power, strength, traction and easy maintenance so necessary for dependable, uninterrupted service on the job. Your nearest Mack branch or distributor will give you complete details. You'll find it's a story worth listening to.

**Whether in stripping or excavating, Model LR SUPER MACK trucks keep the loads moving—fast.**

**Mack**

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Mack Trucks, Empire State Bldg., New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; Long Island City, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

COSTS
ALLIS-CHALMERS

**...when engines are lubricated with TEXACO URSA OIL X★★**

Your heavy-duty gasoline and Diesel engines will run better, perform more work, and last longer when they are lubricated with *Texaco Ursa Oil X★★*. Fully detergent and dispersive, *Texaco Ursa Oil X★★* cleans as it lubricates . . . assures lower maintenance costs.

*Texaco Ursa Oil X★★* cuts down fuel consumption because it keeps rings free and valves functioning smoothly. Your engines deliver full power. *Texaco Ursa Oil X★★* stands up under heat and pressure . . . assuring maximum pro-

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*Photo Courtesy Allis-Chalmers*

tection against wear and corrosion.

### Other Texaco Cost-Savers:

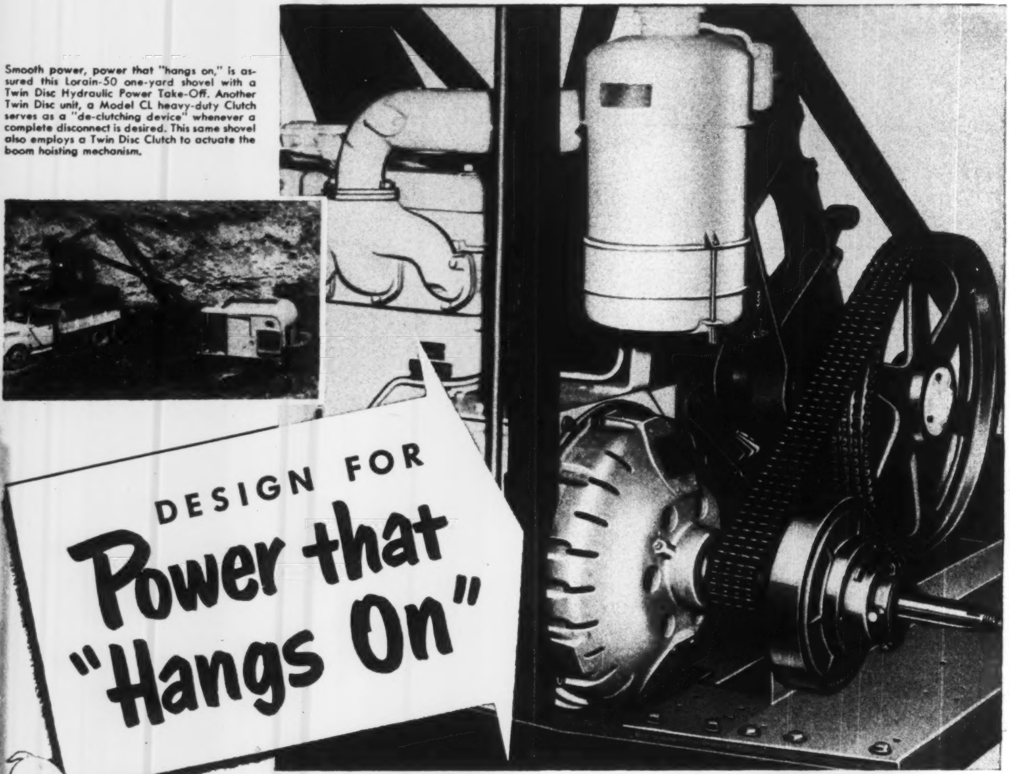
1. *Texaco Marfak*—Seals itself in chassis bearings, seals dirt and moisture out . . . outlasts ordinary greases . . . requires fewer applications. *More than 350 million pounds of Texaco Marfak have been sold.*
2. *Texaco Marfak Heavy Duty* – Offers full protection and economy in wheel bearings, requires no seasonal change . . . reduces maintenance costs.
3. *Texaco Track Roll Lubricant* – Assures longer service life for crawler track mechanisms . . . reduces wear.

A Texaco Lubrication Engineer will gladly show you the way to greater savings through Texaco's Simplified Lubrication Plan. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

**Lubricants and Fuels**

**FOR ALL CONTRACTORS' EQUIPMENT**

Smooth power, power that "hangs on," is assured this Lorain-50 one-yard shovel with a Twin Disc Hydraulic Power Take-Off. Another Twin Disc unit, a Model CL heavy-duty Clutch serves as a "de-clutching device" whenever a complete disconnect is desired. This same shovel also employs a Twin Disc Clutch to actuate the boom hoisting mechanism.



Power "hangs on" to keep the job moving when transmitted through a Twin Disc Hydraulic Power Take-Off.

Even under severest digging conditions, even with the *output* shaft of the power take-off completely stalled, the *engine* continues to work. For the engine *cannot be stalled by digging conditions.* In fact, the engine will continue to work at its *most effective torque* until it picks up the load, or is disconnected.

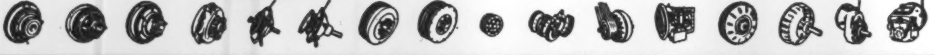
Acceleration of the load is smooth and rapid since the coupling slip cushions the drive and permits sustained engine horsepower output.

And just as the fluid drive *increases* work output, it *reduces* maintenance. "Shocks" never strike solid resistance . . . digging stresses and resulting strains are "absorbed" by the Twin Disc Hydraulic Power Take-Off.

In shovels, in drag lines, in all kinds of heavy-duty construction equipment, it pays to put power to work through a Twin Disc Hydraulic Power Take-Off. Bulletin 144-B gives complete details.

**TWIN DISC**
CLUTCHES AND HYDRAULIC DRIVES

**Clutches & Hydraulic Drives**



**TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois**

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

# INSULATED METAL WALLS

## for INDUSTRIAL and COMMERCIAL BUILDINGS

## ALUMINUM, STAINLESS or GALVANIZED STEEL

More and more architects are turning to insulated metal walls for modern industrial and commercial buildings—owners, too, are enthusiastic about the pleasing over-all appearance achieved through skillful employment of this very practical and economical wall construction. Mahon Insulated Metal Walls are available in three distinct exterior patterns—Ribbed, Fluted, or Flush Plates. The Ribbed and the Fluted Walls are field constructed from wall plates which can be furnished in any length up to 55 Ft., providing thereby high expanses of wall surface without horizontal joints. The Flush Wall is constructed of prefabricated insulated wall panels which can be furnished in galvanized steel only, in any length up to 30 Ft. Prefabricated Fluted Wall Panels with exterior plates of Aluminum, Stainless or Galvanized Steel can also be furnished in any length up to 30 Ft. Thermal properties of all Mahon Insulated Metal Walls are excellent. See Sweet's File for complete information and typical installations, or write for Catalog B-51-B.

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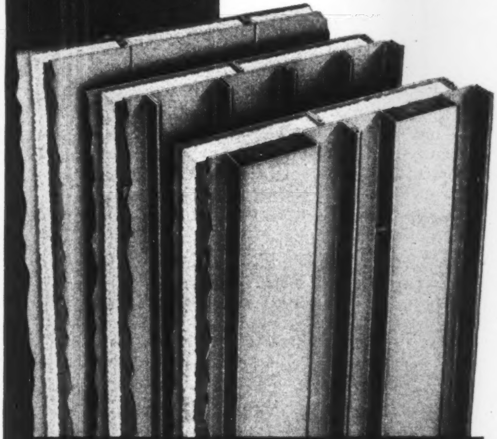
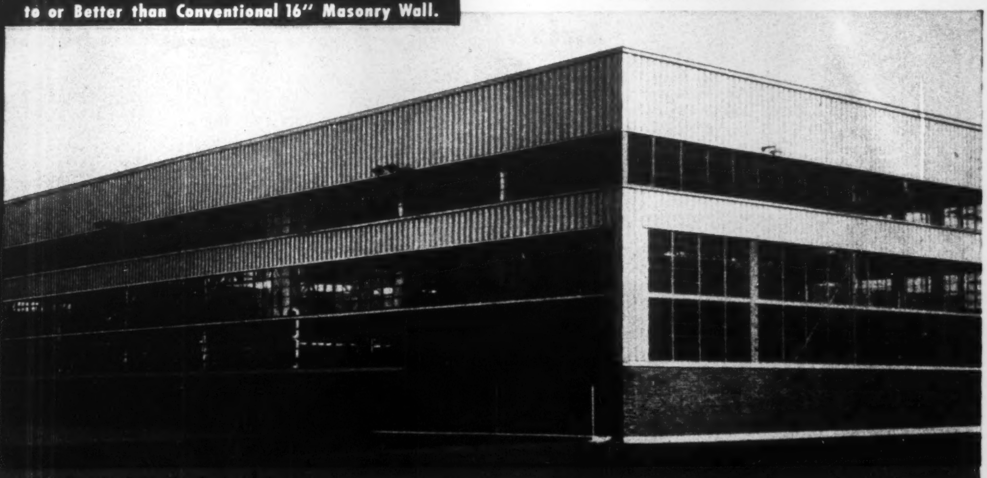
Manufacturers of Insulated Metal Walls; Steel Deck for Roofs, Floors and Partitions; Rolling Steel Doors, Grilles, and Underwriters' Labeled Rolling Steel Doors and Fire Shutters.

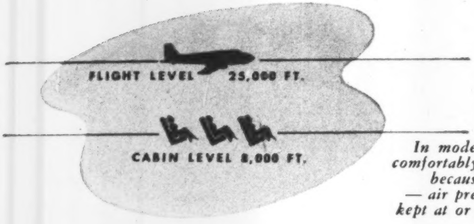


**Over-all "U" Factor of Various Types is Equivalent to or Better than Conventional 16" Masonry Wall.**



New Plant for Budd Mfg. Co. Insulated Metal Walls employed here are Mahon Field Constructed Fluted Type, with Exterior Wall Plates of Aluminum. [illegible] Architects and Engrs. [illegible] Doors.

MAHON


FLIGHT LEVEL 25,000 FT.
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*In modern air-liners you breathe comfortably at altitudes of 25,000 ft., because your cabin is "Pressurized" — air pressure inside the plane is kept at or near normal sea level pressure.*

# Boilers, too, "breathe" easier when their combustion air is "pressurized" using forced draft

Cleaver-Brooks experience with thousands of steam boilers, of the self-contained type, has conclusively proven these operating advantages of forced draft:

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- — the electrical load, or power requirement, of a forced draft fan is at a minimum, because the fan handles a lesser volume of air.
- — low fan maintenance and longer fan life with forced draft fans since they operate with cool, clean boiler room air — no problems with high bearing temperatures and corrosion.
- — air is under pressure in the combustion chamber of a forced draft boiler, with no possibility of "diluting" air entering the chamber. Maximum boiler efficiencies are always attained when head plates and casings are tight.
- — lower initial fan cost, better space arrangement, and better appearance are gained because forced draft fans are considerably smaller.
- — casings for forced draft fans are cool — require no insulation — contribute to safer operation and cooler boiler rooms.

Forced draft is one of many reasons why you get a greater return from your investment in a Cleaver-Brooks boiler — a boiler of foremost quality in every detail and with many immediate and long-range cost-saving features. Cleaver-Brooks self-contained boilers are available for oil, gas, combination oil and gas firing — 15 to 500 hp., 15 to 250 lb. p.s.i.

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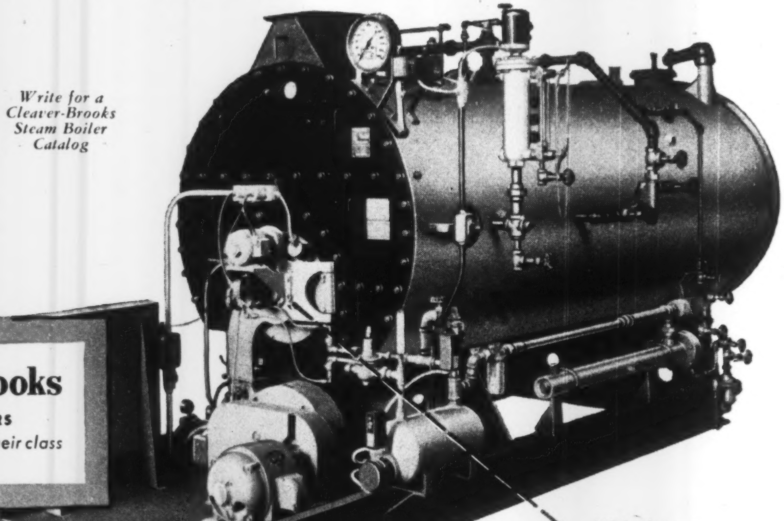
**389 E. Keefe Ave., Milwaukee 12, Wis.**

*Write for a Cleaver-Brooks Steam Boiler Catalog*



**Cleaver-Brooks**
**STEAM BOILERS**
*the first and finest of their class*

. . With the new Cleaver-Brooks Rotary Burner

*Save* **Men...Money...Material**
*with* **Concrete Joist Construction**

In these days of critical shortages—when men and money and material must be used to the very fullest, there is one method of building that truly meets the need on every count—it's Ceco's Meyer steelform construction. For here is a building way that saves as it serves:

*Saves* men because less time and labor are required in providing open wood centering and form work.

*Saves* money because less concrete is used . . . the dead load is kept at a minimum . . . less lumber is needed . . . and since removable steelforms can be used over and over again, only a nominal rental fee is charged.

*Saves* material because only a minimum of critically short steel is needed —and even here less concrete is necessary than required by other concrete floor constructions.

Ceco originated the removable steelform method of concrete joist construction. The company is first in the field—actually providing more services than all competitors combined. So, when concrete joist construction fits the need, call on Ceco . . . the leader over all.

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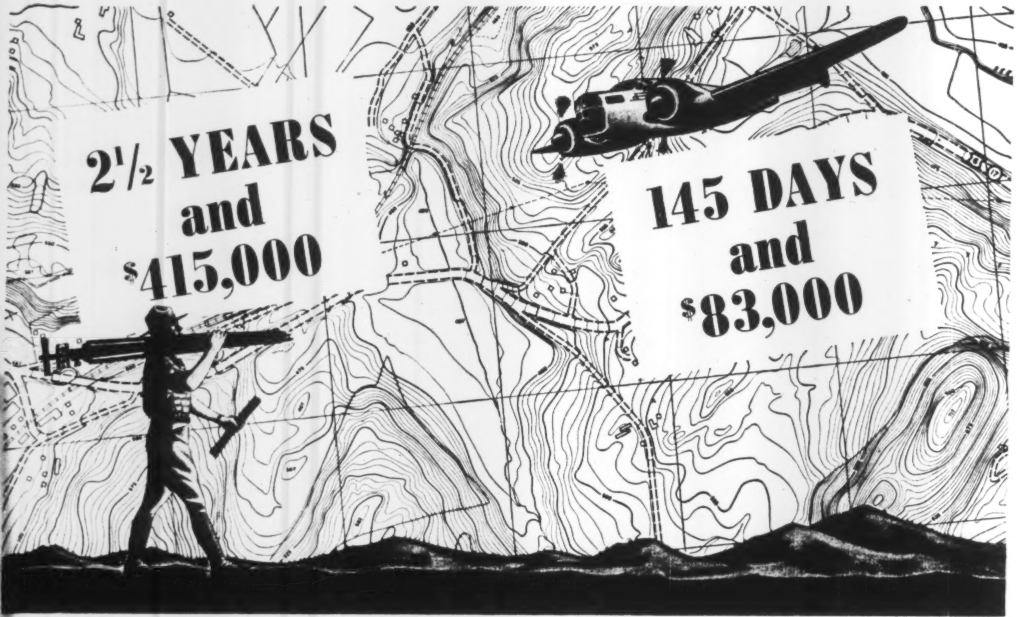
**CONCRETE JOISTS** eliminate much of the concrete below the neutral axis, saving money, saving material. Suited to buildings with long spans: stores, offices, apartments, hotels.

**CECO STEEL** ®

*In construction products* **CECO ENGINEERING** *makes the big difference*

# How Would You Order This Topographic Survey?



NOW TRAFFIC ROLLS on the Pennsylvania Turnpike's new eastern extension. This big link in our national transportation system is open two years earlier—helped by speedy, dependable AERO mapping.

This 140-mile extension started from scratch in December, 1947. Within 145 days Aero Service delivered the needed maps for its design and location. Net cost—$83,000. Ground methods would have taken 2½ years, and cost five times as much!*

Since 1944 AERO has aided the highway departments of 10 States in the solving of the great problems involved in heavy, through traffic. During the same period, in 33 States AERO has completed major topographic mapping projects for new industrial development, mining, railroads, and water systems.

Today's greatly stepped-up demand for more production calls for new industrial plants. Industry's expansion needs are being met by the capable engineering services of Aero Service, who deliver 2 ft. contour maps for building location, 5 ft. contour maps for roads, and 10 ft. contour maps for fringe areas. Along with important time-saving in these urgent days, AERO has proved its ability to produce the required maps at a fraction of the cost of ground methods. That's why AERO maps for industry all over the world—in Alaska, Canada, the United States, Latin America, the Middle East and Africa.

AERO's photogrammetric engineers can expedite your long-range plans. For more information, request ***"You Can See More From The Air,"*** a 24-page booklet which tells how AERO mapping serves industry.

**AERO**
**SERVICE CORPORATION**
*236 E. COURTLAND ST., PHILA. 20, PA.*
*Oldest Flying Corporation in the World*

---

***Authority: Gannett, Fleming, Corddry and Carpenter, design and location engineers for the Pennsylvania Turnpike Extension.**

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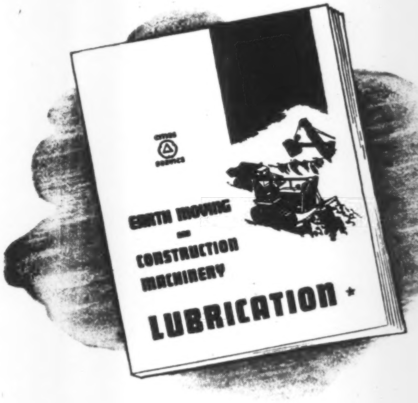
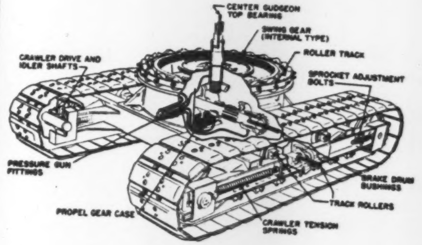
# Best-Telling Book

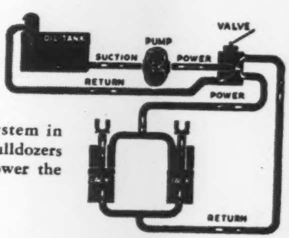

CITIES SERVICE
EARTH MOVING
—
CONSTRUCTION
MACHINERY
LUBRICATION *

## CONTENTS:
## WHAT LUBRICANTS FOR WHAT APPLICATIONS —AND WHY


CENTER GUDGEON TOP BEARING
SWING GEAR (INTERNAL TYPE)
ROLLER TRACK
CRAWLER DRIVE AND IDLER SHAFTS
SPROCKET ADJUSTMENT BOLTS
PRESSURE GUN FITTINGS
BRAKE DRUM BUSHINGS
TRACK ROLLERS
PROPEL GEAR CASE
CRAWLER TENSION SPRINGS

**"FIG. 23**

Shows internal type open gears of swing rack and one method of lubricating trunion and other shaft bearings . . . The 'propel' gears are enclosed and oil lubricated. The crawler track and other parts lubricated through pressure gun fittings require grease. See lubrication chart for proper type and grade . . ."


OIL TANK
PUMP
VALVE
SUCTION
POWER
RETURN
POWER
RETURN

**"FIG. 33**

Hydraulic system in use on some bulldozers to raise or lower the blade."

YOUR TYPE of construction equipment—engines included—is plainly, soundly covered in this book. You'll be able to judge for yourself which types of lubricant best suit various machines and conditions. You can make your own point-by-point check-up on the complete line of Cities Service lubricants—engineered in types and grades sure to be more than a match for fierce loads, weather and terrain. The performance records prove how sharply maintenance costs go down . . . how steadily grueling schedules are met . . . with Cities Service lubricants on the job. Call the nearest Cities Service office for competent aid, or write us direct.

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**2500-Family Apartment Project in Brooklyn—**This is Vandervere Estates, an attractive new development occupying a four-square-block area in central Brooklyn. Vandervere Estates consists of sixty 6-story brick structures, with living accommodations for 2500 families. Each building is elevator-equipped, and has apartment units of from 2 to 4½ rooms. Like so many other well-designed projects, the buildings comprising Vandervere Estates have sturdy steel frameworks of Bethlehem Structural Shapes. *Architects and Engineers:* Kavy and Kavovitt, Brooklyn. *Steel Fabricator and Erector:* Gold Seal Iron Co., Brooklyn.

BETHLEHEM STEEL

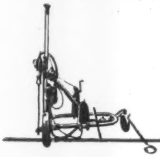
# for DRILLING POWER and UNLIMITED VERSATILITY

*you can't beat this New*

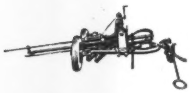
## FM-3 WAGON DRILL

Most construction and mining men are familiar with the famous X-71 WD Rock Drill. Its drilling speed and hole cleaning ability on deep holes are recognized wherever Wagon Drills are used. It is the only drill made especially for Wagon Drill service.

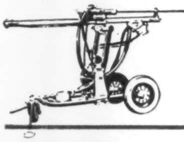
To permit even further utilization of the power and reliability of this drill, we introduce a brand new mounting known as the FM-3. It incorporates a new type of lifting mechanism and a rugged yoke that permits easy drilling in any position encountered in modern rock excavation.



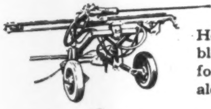
Notice how the swivel wheels are turned and how the drill extends beyond wheels for line hole work against a face.



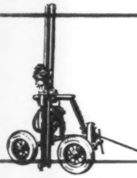
And how low the yoke can be lowered for efficient toe hole drilling.



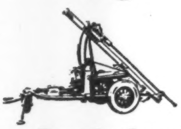
Or how, by a handy crank actuating a powerful worm gear arrangement, the yoke and drill can be easily raised to highest drilling position.



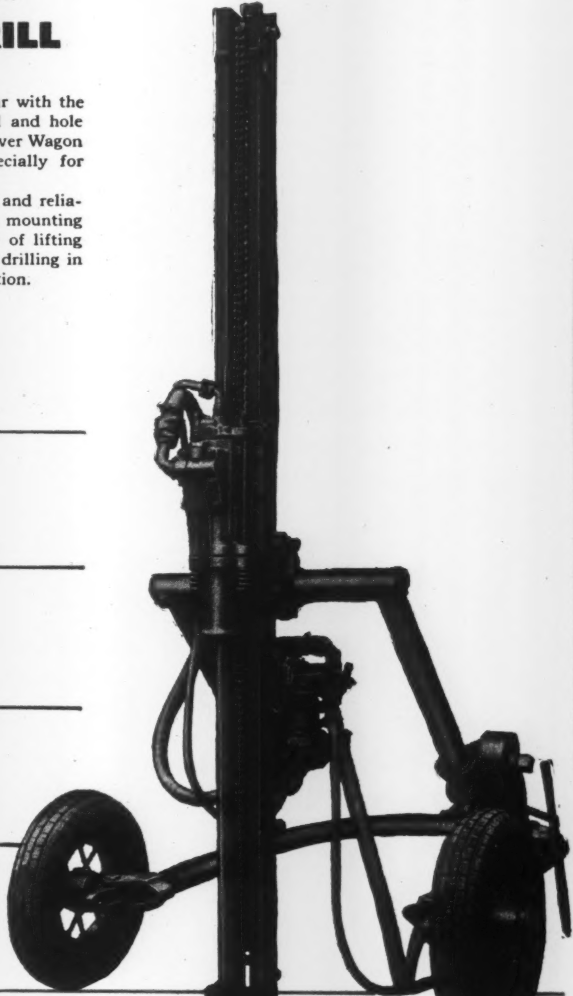
Here's an exceptionally stable and easily moved set up for drilling hole after hole along a face.



What could be more convenient for line hole work? It takes but a minute to swing the swivel mounted wheels through a 90 degree angle.



And for steeper angle drilling, here's another easy set up. All controls are at the operator's fingertips.



Ad 596-S

Remember Ingersoll-Rand Drills are sold and serviced by men who know rock drilling. Take advantage of this highly trained and skilled service. There is an Ingersoll-Rand branch office and distributor near you. Write or call today.

**Ingersoll-Rand**
11 BROADWAY, NEW YORK 4, N. Y.

AN IDEAL DRILLING TEAM—TWO FM-3 WAGON DRILLS AND THE NEW I-R 600 C. F. M. "GYRO-FLOW" PORTABLE COMPRESSOR

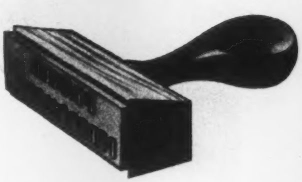
# ---Mark

# PROVEN PERFORMANCE

BUCYRUS ERIE
BUCYRUS ERIE
51-B

Heaped dipper loads in tough going are a steady proposition with the 2-yd. 51-B on the job.

# of a Preferred Excavator



THE four most important measures of excavator performance are a smooth fast work cycle, ability to stand up under punishment, quick front end convertibility, and ease of maintenance. Bucyrus-Erie fills the bill on all four.

Bucyrus-Erie's outstanding design balance ties in the dig-swing-dump operations smoothly and efficiently. Highly responsive controls, smooth clutch action and positive, independent crowd help operators get bigger loads every pass . . . more passes every hour than ever before.

There are seven different Bucyrus-Erie models in the ⅜- to 4-yd. range of gasoline, diesel, and single-motor electric machines — each with size and strength throughout to match its rated capacity. Each can be quickly converted in the field to the front end that produces the best job efficiency. And simple, clean design makes parts readily accessible, maintenance easy.

Best proof that these features bring top performance is out in the field. For instance, yardage-wise owners have bought more 10-B's than any other ⅜-yd. excavator . . . more Bucyrus-Eries for rock than any other make. The *record* shows that with owners, operators and maintenance men alike, Bucyrus-Erie is the one line that's

259E51C

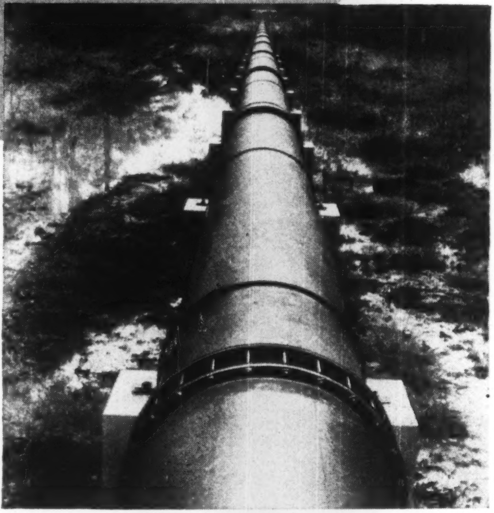
*Most Compared*

*Most Preferred*

**BUCYRUS ERIE**

SOUTH MILWAUKEE, WISCONSIN

# A Dresser-coupled steel line delivers water cheaper...



**In Georgia,** Savannah's new 42″ Dresser-coupled steel supply line crosses swampy ground on concrete cradles supported by wooden piles. Beam strength of the steel pipe kept the number of supports at a minimum. Flexibility of couplings protect line against stresses.

The cheapest way to deliver water to the place where it turns into revenue is with a Dresser-coupled steel line—the line that

- **Cuts installation costs**
- **Cuts leakage losses**
- **Cuts maintenance costs**

Water supply lines frequently must cross marshy or unstable ground. In such locations, steel pipe, joined with flexible Dresser Couplings, offers unusual economies.

The greater beam strength of steel pipe keeps the number of pile bents or other pipe supports at a minimum. Less cumbersome steel pipe is easier to handle—and with Dresser Couplings, the amount of heavy equipment required is small. The longer pipe sections reduce the number of field joints to be made.

Easy to install, absolutely tight, Dresser Couplings speed pipe joining, absorb normal expansion-contraction stresses, and guard your line against possible infiltration of polluted ground water through joints should internal line pressure drop. Joining crews are small, easy to manage, and need have no special skills. Joints *stay* tight—cut maintenance to the bone.

Write today. Find out how your proposed line can "Deliver Water Cheaper".

***BE SURE*** **you get the best line at the best price. Put steel pipe and Dresser Couplings in your specifications.**

**DRESSER**

"FLEXIBLE-TIGHT"

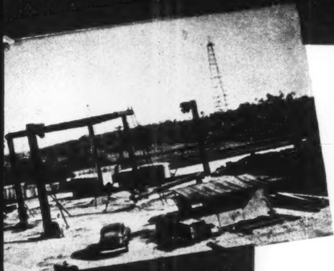
**COUPLINGS**

Dresser Manufacturing Division, 50 Fisher Ave., Bradford, Pa. (One of the Dresser Industries)—In Texas: 1121 Rothwell St., Houston. In Canada: 629 Adelaide St., W., Toronto. Sales Offices: New York, Philadelphia, Chicago, Houston, San Francisco.

Raymond conquers chubascos... in

# THE WORLD'S MOST UNUSUAL SOIL BORING JOB

FOR VENEZUELAN OIL CONCESSIONS, LTD...



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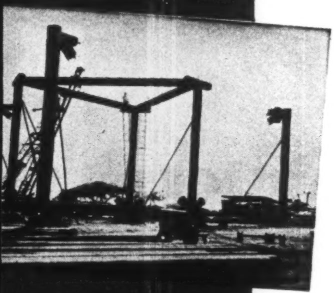
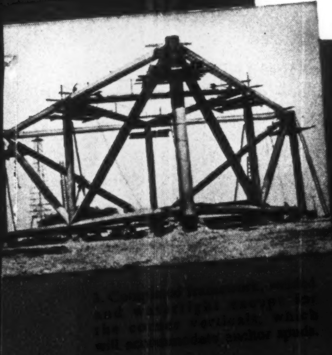


[illegible] steel pipe being used

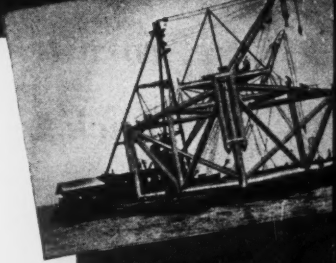


3. Completed framework, welded and watertight except for the corner verticals, which will accommodate anchor spuds.

**The Problem:** 250-foot Gow soil borings, accurately spotted five to ten miles offshore in the deep waters of Lake Maracaibo, Venezuela. The Project: pile foundations for future oil-well derricks. Special Hazard: 70-mile-an-hour "chubascos," violent squalls that would wreck temporary platforms.

**The Solution:** Raymond engineers designed a triangular *floating* platform of 22″ steel pipe, welded and watertight. The three corner members were left open for 120-foot-long anchor spuds. Assembled on shore from steelwork fabricated in New York, the 60-ton float was skidded onto two barges and towed 32 miles to the first boring location where floating derricks launched it. Spuds and deck equipment were placed later, including winch-controlled anchors at each corner to help in spotting the float and holding it steady during boring operations.

**The Moral:** When the problem is tough, the answer must still be *right*. That's when it pays to have a resourceful, experienced organization on the job . . . like Raymond!



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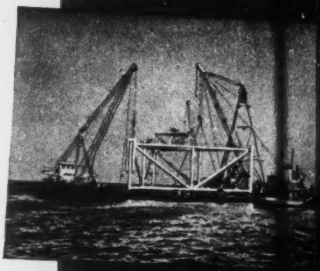

[illegible] float [illegible] towed 10 [illegible] framework.

[illegible]

AROUND THE WORLD
FOUNDED 1897

**Raymond**
CONCRETE PILE CO.

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BRANCH OFFICES
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*THE SCOPE OF RAYMOND'S ACTIVITIES . . . includes every recognized type of [illegible] construction—concrete, composite, precast, steel, pipe and wood piles. Also caissons, underpinning; construction involving shore protection, shipbuilding facilities, and harbor and river improvements; borings for soil investigation; and cement mortar lining of oil and water pipe lines 4″ to 144″ in diameter by the Centriline Corporation, a Raymond subsidiary.*

## *the **fast,** **low-cost** way to get worn teeth back in service!*

1. Worn tooth . . .

2. Plus AMSCO Tooth Repointer . . .

3. Equals like-new tooth—ready for service!

# AMSCO® tooth repointers

**AMSCO Repointer Bars**

3 teeth partially rebuilt with AMSCO Repointer Bars to show sectional view of welding method. These Repointer, or Wedge Bars, are also made in many shapes and sizes. Apply AMSCO Economy Hardface to the rebuilt tooth *—for as much as 3 times longer service!*

● Here's a typical example of a badly worn dipper tooth completely restored to service . . . simply by welding on the AMSCO Cast-To-Size Tooth Repointer. The result is like-new service life and efficiency, plus a long-wearing tooth of Manganese Steel—the steel that actually work-hardens in service. Cost? *Far less than replacement!*

Wherever equipment has teeth that wear, more and more owners are using money-saving AMSCO Tooth Repointers . . . available in a wide variety of styles and sizes.

**Get all the facts! Write today for Bulletin W-10-A —showing complete instructions for use.**

*put LIFE into service with*

**AMSCO®**

**WELDING PRODUCTS**

**AMERICAN Brake Shoe COMPANY**

**AMERICAN MANGANESE STEEL DIVISION**

**379 EAST 14th STREET • CHICAGO HEIGHTS, ILL.**

**Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.**

Look how the strong welded mesh of

**Pittsburgh Steeltex**

**Floor Lath**

assumes its proper position in a concrete slab

You can readily see why a slab poured over Pittsburgh Steeltex Floor Lath means a better, stronger floor. It is properly reinforced with embedded galvanized welded wire mesh and properly cured because moisture is retained by tough waterproof backing. Furthermore, construction costs can be cut since work may continue on the floor below while pouring is in progress. For further good reasons to specify Steeltex, see Sweet's or write for our catalog D.S. 133, Dept. ER, Pittsburgh Steel Products Co., Grant Bldg., Pittsburgh 30, Pa.

**Pittsburgh Steel Products Company**

*A Subsidiary of Pittsburgh Steel Company*

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## for WESTERN'S COMPRESSED CONCRETE PILES

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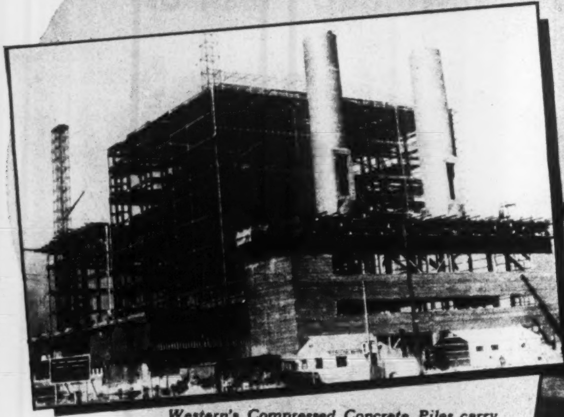
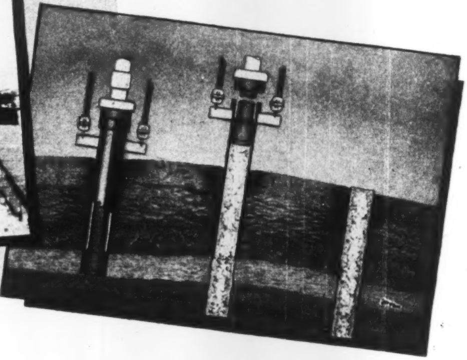
- **DEPENDABLE**
- **LOW COST**



*Western's Compressed Concrete Piles carry Toronto's first major Steam-Electric Plant.*



**WESTERN COMPRESSED CONCRETE PILES** require no encasement; they are available immediately despite steel shortages. Their exceptional carrying capacity and economy have led to their use throughout the country in soils firm enough to act as a form for the concrete.

**TYPICAL COMPRESSED CONCRETE PILE JOBS:**

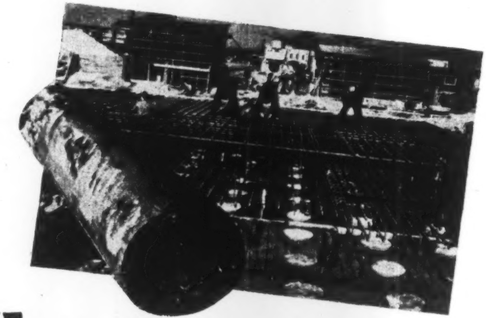
| | |
|---|---|
| Alexandria, Va. | Hunting Towers Apartments |
| Toronto, Ontario | Liquor Control Board Building |
| South Amboy, New Jersey | Steam-Electric Power Plant |
| Norfolk, Virginia | DePaul Hospital |
| Tallahassee, Fla. | W. T. Edwards Tuberculosis Hospital |
| Knights Landing, California | Grain Elevator |

**WESTERN** engineers are available at any time to discuss your foundation problems and offer expert advice. Write for illustrated brochure describing in detail Western Piles and service.

***FOUNDATIONS FOR:*** **Industrial Plants, Power Plants, Bridges, Piers and Docks, Airports, Housing Projects, Steel Plants, Commercial Buildings, Schools, Etc., Etc.**

**SEE OUR CATALOG IN SWEET'S**

The drive-tube and close-fitting core are driven to a required depth. The core is removed and the tube filled with concrete. Then the core is replaced on the concrete and the tube pulled by Western's positive method of automatically depositing concrete so as to prevent separation and assure a shaft of constant diameter, greater at all points than the diameter of the forming tube.



More than 2,000 Western Compressed Concrete Piles support the Richard L. Hearn Steam-Electric Generating Plant at Toronto. Inset is a pile pulled after being formed against soil compacted by driving. Note the constant diameter and smooth surface.

**BUTTON BOTTOM PILES • COMPOSITE PILES • PEDESTAL PILES • CAISSON PILES**
**PROJECTILE PILES • COMPRESSED CONCRETE PILES • DRILLED-IN CAISSONS**
**PRE-DESIGN AND PRE-CONSTRUCTION LOAD TESTS • SOIL BORINGS**
**CORROSION PROTECTION FOR H-BEAM PILES**

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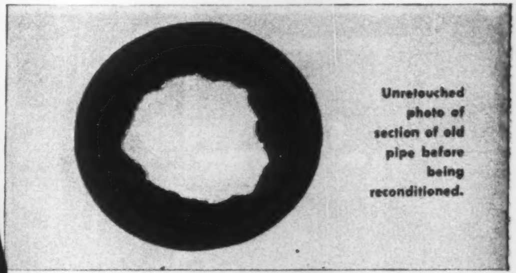
**WESTERN FOUNDATION CORPORATION**

**308 W. Washington St., Chicago 6, Ill. • 2 Park Avenue, New York 16, N. Y.**

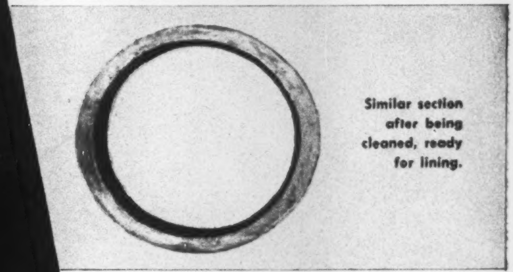
# Get NEW efficiency for OLD pipe lines

[illegible]

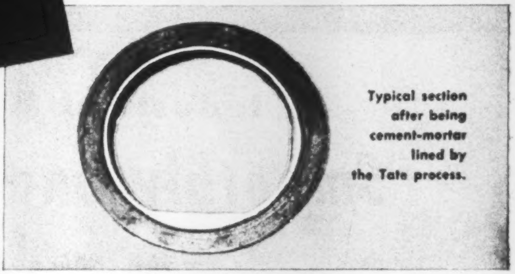
**TATE PROCESS applies cement-mortar lining to water, oil and gas pipe lines in place**



Unretouched photo of section of old pipe before being reconditioned.



Similar section after being cleaned, ready for lining.



Typical section after being cement-mortar lined by the Tate process.

Could the operation of your pipe line be improved? Whether it is of steel or cast iron, here is the way this famous process can help you get better performance from old lines.

- Restores flow coefficients
- Reduces pumping costs
- Reduces maintenance costs
- Prevents leakage
- Protects against corrosion
- Protects against discoloration and contamination

This process produces a thorough reconditioning of old pipe lines, with only momentary interruption of service during installation of by-pass pipe. With specially designed, patented equipment, it cleans corroded matter and tubercles from pipe line walls. Then it applies a cement-mortar lining to the walls, varying its thickness according to need.

The result is a smooth, strong, permanent lining that restores the original efficiency of the line at much less expense than the cost of a new line. It is effective for protecting and greatly extending the life of new steel lines as well as for renewing old ones. Pipes of all diameters from 4" upwards can be serviced. The Tate process is especially adapted to lines from 4" to 16" in diameter. Larger lines are reconditioned by the Centriline process.

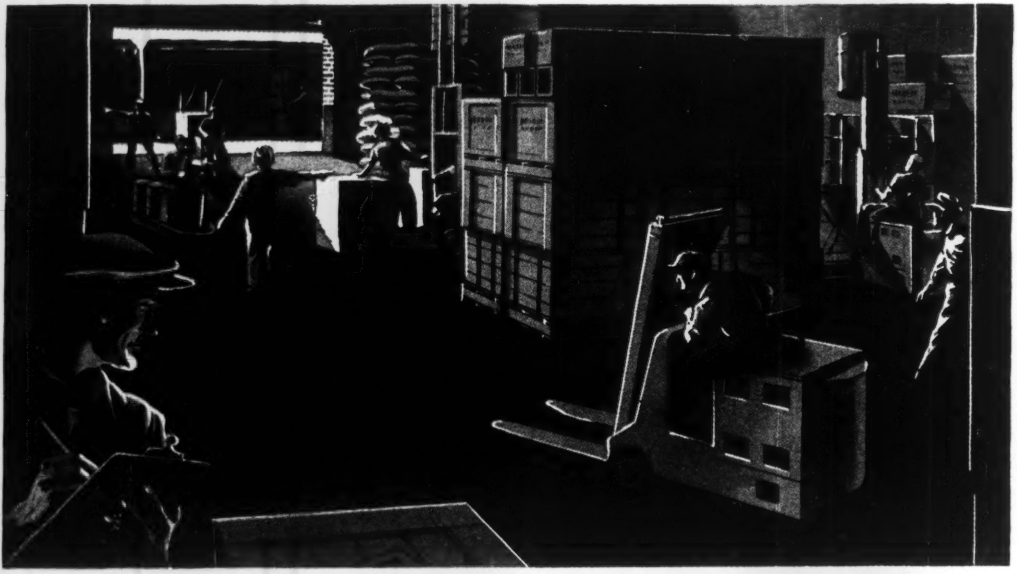
Ever-increasing demand for these services and millions of feet of reconditioned lines that have been in operation for years are evidence of their value. It will pay you to investigate.

Write for complete details today.

In eastern and central states the CENTRILINE CORPORATION of 140 Cedar Street, New York 6, N.Y., offers Centriline service and has been licensed by Pipe Linings, Inc. to line small pipe lines by the Tate process.

**PIPE LININGS, Inc.**

*A subsidiary of*
AMERICAN PIPE AND CONSTRUCTION CO.
P. O. Box 3428, Terminal Annex, Los Angeles 54, California



## Industrial Materials Roll

# *Smoothly and Economically*

## on Mastic floors

The plant interior above is typical of many that are faced with the need for increased speed and efficiency in materials handling.

And one of its prominent characteristics is the Asphalt Mastic Floor made with Flintkote Flooring Emulsions.

Why is this floor surfacing so popular for warehouse installations? Well, look what it offers:

**SERVICE LIFE** is long and trouble-free. Mastic floors made with Flintkote Emulsions are *heavy-duty* in the real sense of the word. They take exceptionally heavy point and moving loads. They provide a lasting smooth surface for material handling equipment. They're self-healing of minor scars.

**MAINTENANCE** is minimized. Because these floors are so tough, repairs are infrequent. Yet when patching is necessary, the job is quick. And the smooth, unbroken surface is easy to keep clean and free from debris.

**INSTALLATION** is fast, easy and inexpensive. This mastic surfacing can be laid cold over almost any clean, firm sub-floor. This plus easy leveling and quick setting means either new installations or re-flooring go down in record time . . . with the area closed to traffic for as little as 24 hours.

And because of their unusually high capacity to absorb shock, mastic floors are especially satisfactory in multi-story installations. Then, too, the resilient surface is *much* quieter, feels warmer and will not dust under even the roughest use. All of which gives you a pleasanter, more comfortable surface on which to walk and work.

Add these advantages together, and the sum total is a floor that helps you handle materials more easily, and more economically. Get complete information on Flintkote Flooring Emulsions, and how Mastic Floors can help you. Specifications for mixing and installing are yours for the asking. Write today.

**THE FLINTKOTE COMPANY**
*Industrial Products Division*
**30 Rockefeller Plaza, New York 20, N. Y.**
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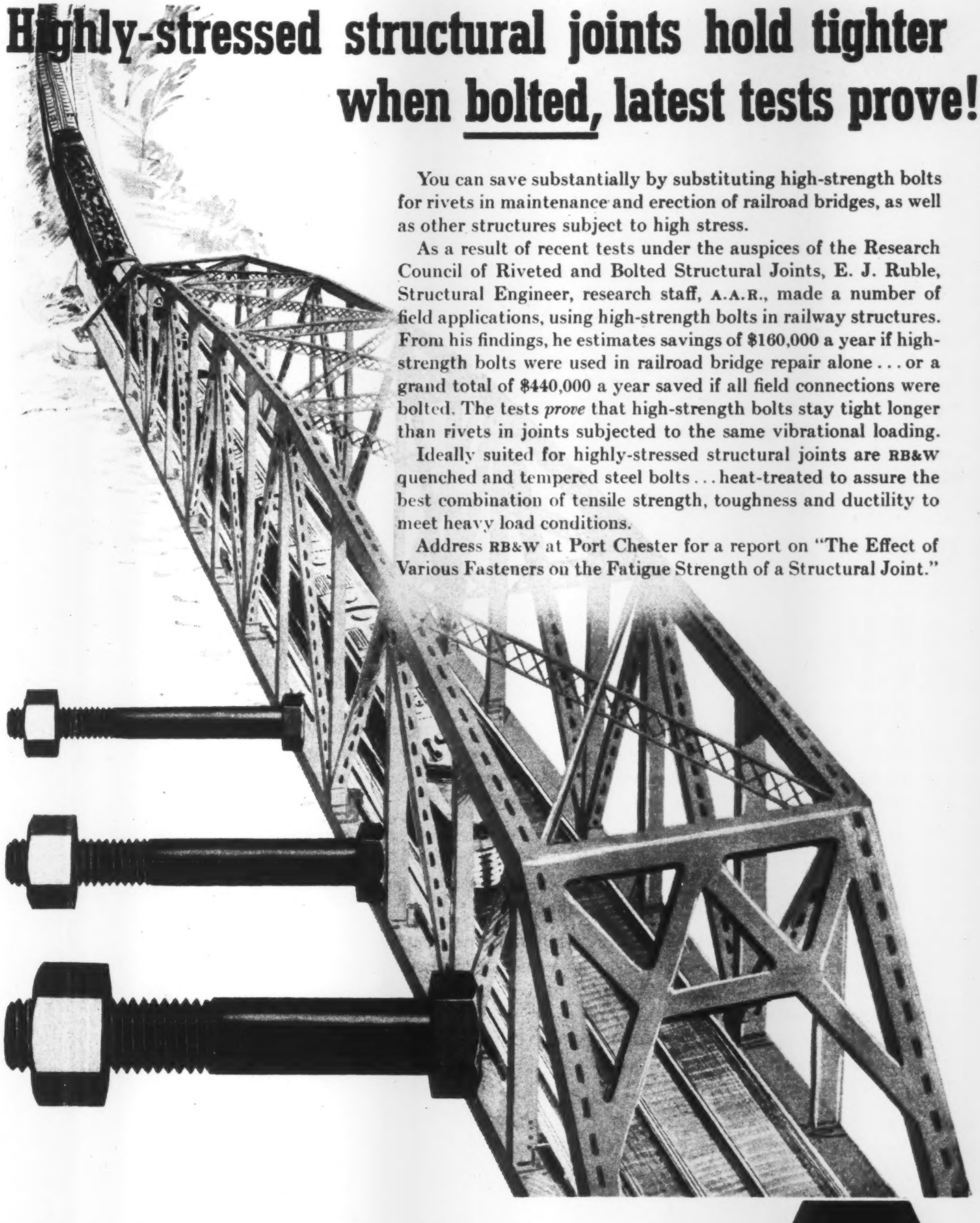
FLINTKOTE INDUSTRIAL PRODUCTS

**FLINTKOTE** *Products for Industry*

# Highly-stressed structural joints hold tighter when bolted, latest tests prove!



You can save substantially by substituting high-strength bolts for rivets in maintenance and erection of railroad bridges, as well as other structures subject to high stress.

As a result of recent tests under the auspices of the Research Council of Riveted and Bolted Structural Joints, E. J. Ruble, Structural Engineer, research staff, A.A.R., made a number of field applications, using high-strength bolts in railway structures. From his findings, he estimates savings of $160,000 a year if high-strength bolts were used in railroad bridge repair alone . . . or a grand total of $440,000 a year saved if all field connections were bolted. The tests *prove* that high-strength bolts stay tight longer than rivets in joints subjected to the same vibrational loading.

Ideally suited for highly-stressed structural joints are RB&W quenched and tempered steel bolts . . . heat-treated to assure the best combination of tensile strength, toughness and ductility to meet heavy load conditions.

Address RB&W at Port Chester for a report on "The Effect of Various Fasteners on the Fatigue Strength of a Structural Joint."

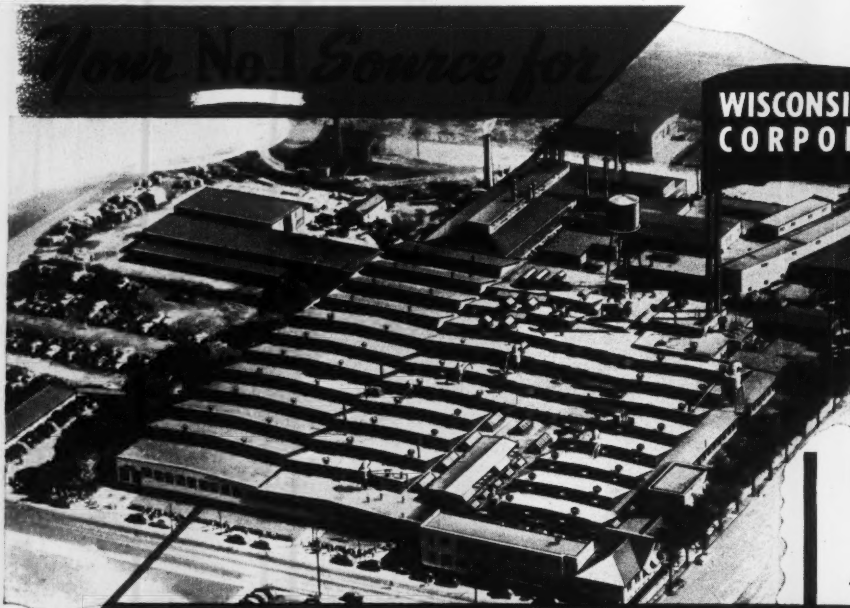
**RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY**

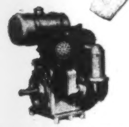
**RB&W**
THE COMPLETE QUALITY LINE

Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Detroit, Chicago, Chattanooga, Dallas, Oakland. Sales agents at: Portland, Seattle

**106 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG**

*Your No. 1 Source for*




4-cycle single cylinder
3 to 6 hp.

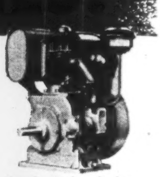
**Heavy-Duty *Air-Cooled* ENGINES!**

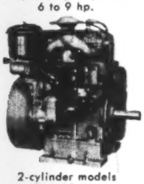
As a potential or present user of internal combustion engines either as power components on original equipment or as auxiliary power units, you will readily recognize the advantages of dealing with an outstanding leader in the engine field.

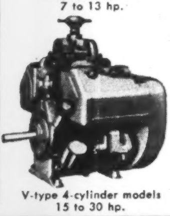
The complete engineering and manufacturing facilities and resources of this company are devoted *exclusively* to designing and building HEAVY-DUTY AIR-COOLED ENGINES. There is nothing to divert attention from this highly specialized industrial operation.

Because constant engineering effort and manufacturing skill are applied entirely to the improvement and large volume production of WISCONSIN HEAVY-DUTY AIR-COOLED ENGINES, in a complete, all-purpose power range, you have the best assurance not only of dependable power units ideally suited to your power applications but, of equal importance . . . you have, here, the world's most dependable source of supply both for engines and original factory parts.

Supporting this endeavor are key distributors of impressive recognition in the territories they serve, and a staff of competent Wisconsin Motor Corporation field men, in close liaison between factory and customer. Your best interests are our primary interest.


4-cycle single cylinder
6 to 9 hp.


2-cylinder models
7 to 13 hp.


V-type 4-cylinder models
15 to 30 hp.

MOST
H.P. HOURS

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*World's Largest Builders of Heavy-Duty Air-Cooled Engines*

MILWAUKEE 46, WISCONSIN

Only Carlon...

## The first real pipe that is plastic

ONLY CARLON combines the inherent advantages of plastic with the desirable characteristics of metallic pipe. This new pipe is guaranteed against rot, rust, and electrolytic corrosion and is impervious to sulphurous waters, alkalies, metallic salts, and corrosive wastes. As a result, CARLON has a projected trouble-free service life many times longer than ordinary pipe. Because of its light weight (1/9th that of steel), CARLON can be installed rapidly without special tools or heavy materials handling equipment.

CARLON PIPE can be used for drinking water, sludge, drainage and irrigation systems, ventilating and cooling lines, hydraulic sluicing, and intake and exhaust piping. It is recommended also for low pressure air lines and exposed or concrete-incased electrical conduit.

FLEXIBLE and RIGID types of CARLON are available in all standard pipe sizes. Flexible CARLON plastic pipe is furnished in long lengths (requiring fewer fittings) and will conform to irregular surface contour, ditch line, or structural plan. Rigid CARLON is supplied in 21-foot coupled sections which can be joined rapidly by means of molded threaded fittings. In addition, this pipe can be threaded with conventional pipe dies. Complete line of fittings incorporating standard I.P.T., is available for plastic-to-plastic as well as plastic-to-metal connections. When you pipe for the future, specify ONLY CARLON plastic pipe!

CARLON CP

**CARLON PRODUCTS CORPORATION**

IN CANADA: MICRO PLASTICS, LTD., ACTON, ONTARIO

**10152 MEECH AVENUE • CLEVELAND 5, OHIO**

**1. It's FASTER!**
**2. It's CHEAPER!**

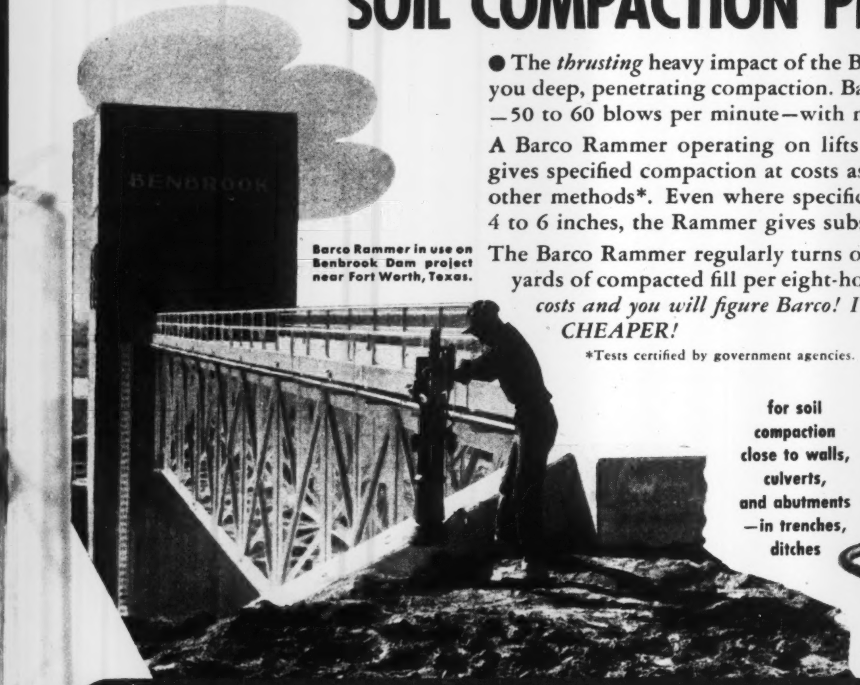
# —Two BIG Reasons Why The BARCO Rammer *is the answer to your* SOIL COMPACTION PROBLEMS

● The *thrusting* heavy impact of the Barco Rammer gives you deep, penetrating compaction. Barco's work fast, too —50 to 60 blows per minute—with no operator fatigue.

A Barco Rammer operating on lifts of 12 to 20 inches gives specified compaction at costs as low as one-fifth of other methods*. Even where specifications limit lifts to 4 to 6 inches, the Rammer gives substantial savings.

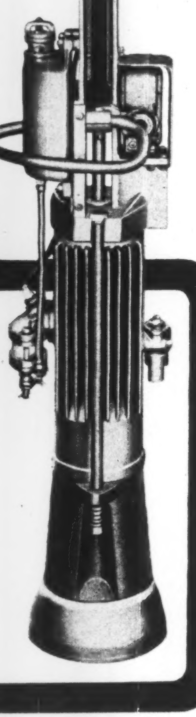
The Barco Rammer regularly turns out 160 to 180 cubic yards of compacted fill per eight-hour day. *Figure your costs and you will figure Barco! IT'S FASTER! IT'S CHEAPER!*

*Tests certified by government agencies.



Barco Rammer in use on Benbrook Dam project near Fort Worth, Texas.

**for soil compaction close to walls, culverts, and abutments —in trenches, ditches**



## BARCO *"Pegson"* GASOLINE RAMMER

**SIMPLE, RUGGED, PORTABLE**—The improved Barco Rammer is a completely self-contained work unit. Take it anywhere; no auxiliary or extra equipment required. Gets the job done with lowest capital investment in equipment!

**EASY STARTING**—Not affected by cold or heat. No heavy parts to move or turn; nothing to freeze. Simple carburetor; "hot spark" magneto ignition.

**LOWER OPERATING COSTS**—Runs 4 to 6 hours on a gallon of gasoline and one-half pint of oil. Negligible maintenance.

**ANYONE CAN OPERATE**—Ask for the nearest Barco distributor to give you a demonstration. See how easy it is to operate. No lifting, straining, or skill required.

**SAFE**—Natural work position keeps operator safe. Operator controls each stroke. Runaway-proof.

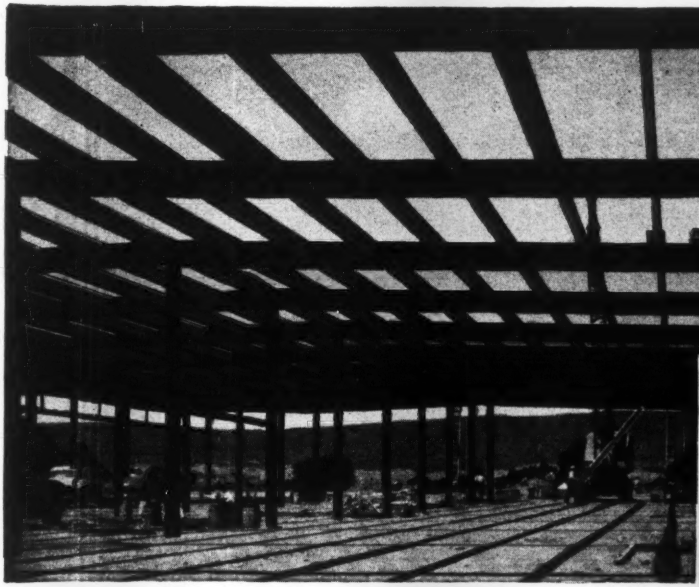
**QUICK DELIVERY**—Now is the time to order while stocks are available. *Be prepared!* Catalog and information on request. BARCO MANUFACTURING COMPANY, 1814 D Winnemac Ave., Chicago 40, Illinois. In Canada; The Holden Co., Ltd., Montreal.

**BARCO DISTRIBUTORS LOCATED IN ALL PRINCIPAL CITIES**

*FREE ENTERPRISE*—THE CORNERSTONE OF AMERICAN PROSPERITY

# Scranton, Pa., Builds for the Future with LIGHT-WEIGHT EASY TO INSTALL J & L JUNIOR BEAMS

**J&L STEEL**



A typical example of steel framework in one of the LIFE plant buildings. Junior Beams contribute vitally to the ease and speed of construction.

Interior view of completed plant occupied by the Eastern Mfg. Div., The Trane Co., showing Junior Beam roof purlins in the economical ceiling construction.

## JUNIOR BEAM ROOF PURLINS SAVE TIME AND MONEY IN CITY'S PLANT CONSTRUCTION PROGRAM

The citizens in the area of Scranton, Pa., have embarked on a farsighted program of industrial plant construction. They call it Lackawanna (County) Industrial Fund Enterprise—LIFE. Its aim is to attract new industries which will provide the district's unemployed with sorely-needed jobs.

Early in the program, the Anthracite Bridge Company, Scranton, worked out an economical building system which has been used in almost every new plant erected.

J&L Junior Beams play an important role in making this low-cost, speedy construction possible.

For example, in Building No. 1 of LIFE's program light-weight Junior Beams were installed as roof purlins. A five-man crew with a light truck-crane plus another five-man "bolting-up" crew erected the entire steel framework of the 180' x 460' building *in less than 10 days!*

The uniformity of Junior Beams made them readily adaptable to variations in design, and their ease of handling further speeded construction—two factors that *saved time and money on the job.*

Junior Beams, produced exclusively by Jones & Laughlin Steel Corporation, are easy to install, require no fabrication other than end connections and bolt holes. They are rigid, vibration resistant, shrink proof, and have a lower deflection factor than other structural sections of equivalent weight.

Why not write today for our new booklet: "Skyscraper Construction for Every Building?" It shows how Junior Beams are used as floor joists, and roof purlins with erection details, specifications, loading and spacing tables.

Jones & Laughlin Steel Corporation
428 Jones & Laughlin Building
Pittsburgh 30, Pa.

Please send me a copy of the booklet entitled, "Skyscraper Construction for Every Building."

NAME____________________

COMPANY____________________

ADDRESS____________________

## JONES & LAUGHLIN STEEL CORPORATION

*From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY *(hi-tensile steels).*

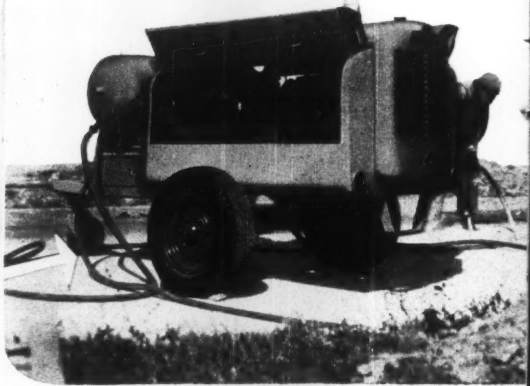
**PRINCIPAL PRODUCTS:** HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

LE ROI

# Le Roi gives you more for your MONEY!

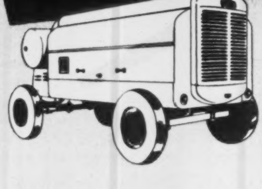
more air power
more footage
more profits

Note caster wheel — it saves time, makes spotting on the job easier.

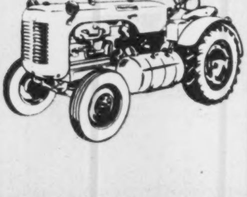


# You're Air-Equipped

## Team-up with Le Roi for Lower Costs

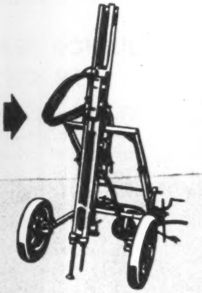


**Why Le Roi Airmasters produce more air for less money:** 10 to 30% lower piston speed for less wear, longer life, lower fuel consumption . . . a heavy-duty engine designed especially for compressor service, not just an automotive unit slowed down — that's why Le Roi Airmasters stay on the job longer, produce more air for less. Sizes from 60 to 600 cfm.

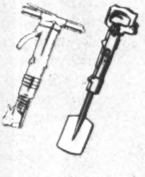


**Why multi-purpose Tractair saves you money:** Tractair is a tractor-105 compressor unit that can be equipped with a wide variety of attachments. This single unit can do the work of specialized expensive equipment — loading, lifting, backfilling, snow-plowing, etc. — as well as breaking, drilling, digging, and tamping. Keeps your initial investment down, your job costs low.

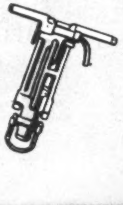
**Why Le Roi-CLEVELAND Wagon Drills cut deep-hole costs:** — 4-inch bore, powerful force of blow, strong rotation, and thorough hole-cleaning action. Higher drilling speed with big bits. You can drill at any angle — put your holes where you want them for better breakage, lower costs. For shallow holes the new lightweight DR34 unit is your best bet.



**Why Le Roi-CLEVELAND Breakers and Spades do more work:** Plenty of wallop for speedy work in the hardest concrete or stiffest clay. Protective air-cushion in front-end assures long life. Well-balanced for easy handling. That's why operators like them — do more with them. Sizes 18 to 80 lbs.



**Why Le Roi-CLEVELAND Sinkers drill more feet per shift:** Strong rotation, and powerful blow from snappy valve action. Drill more inches per minute. Easy to hold, kickback is reduced. Operators are less tired, drill more feet per shift. Sizes 17 to 82 lbs., including the popular H10 and H111.



# to do it Faster

**. . . when you team up with Le Roi Airmaster Compressors and Le Roi-CLEVELAND paving breakers, clay spades, drills, and tampers**

**You get to the job faster**—with high-speed towing made possible by Airmaster running gear and shock-absorbing tow tongue.

**You get air in a hurry** — with the quick start of Airmaster hot-spark magneto ignition!

**You always have plenty of air when you need it,** you're always ready to go — thanks to Airmaster dependability!

So if you want a good job done fast — use Le Roi Airmaster Compressors. It really pays!

For still better results and lower costs, team up with Le Roi-CLEVELAND air tools. They have a valve action that keeps air consumption to a minimum so that air pressure at the tools is higher. They're built to take it, too. That's why you can count on them to break more pavement, dig more clay, drill more rock, tamp more fill.

Remember, Le Roi gives you more for your money. Visit your Le Roi distributor and see why. Send for latest descriptive bulletins.

LE ROI

C-128

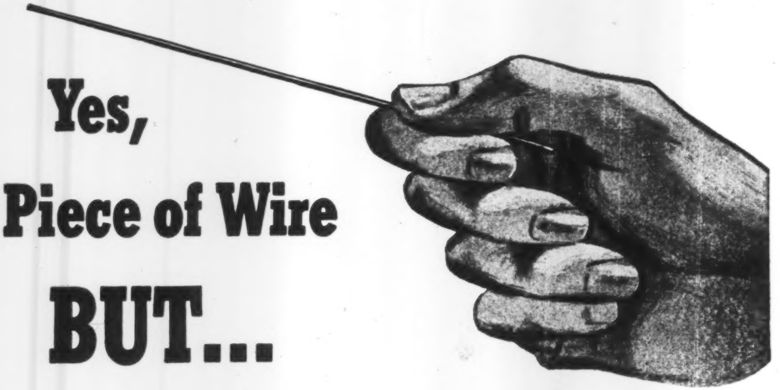
## LE ROI COMPANY

**MILWAUKEE 14, WISCONSIN**

**PLANTS: MILWAUKEE • CLEVELAND • GREENWICH, OHIO**

**Distributors in all these principal cities**

ALABAMA: Birmingham, Mobile — ARIZONA: Phoenix — ARKANSAS: Little Rock — CALIFORNIA: Bakersfield, Long Beach, Los Angeles, San Francisco—COLORADO: Denver, Grand Junction — CONNECTICUT: Hartford — FLORIDA: Jacksonville, Miami, Tampa — GEORGIA: Decatur—IDAHO: Boise, Idaho Falls, Twin Falls, Wallace—ILLINOIS: Chicago —INDIANA: Indianapolis—IOWA: Cedar Rapids, Waterloo—KANSAS: Great Bend, Kansas City, Pratt, Wichita — KENTUCKY: Lexington, Louisville — LOUISIANA: New Orleans, Shreveport — MAINE: Augusta — MARYLAND: Baltimore, Hyattsville — MASSACHUSETTS: Hyde Park, Newton Highlands — MICHIGAN: Detroit, Grand Rapids — MINNESOTA: Duluth, Minneapolis — MISSISSIPPI: Jackson — MISSOURI: Joplin, St. Louis — MONTANA: Billings, Great Falls — NEBRASKA: Omaha — NEW HAMPSHIRE: Manchester — NEW JERSEY: Cranford, Kingston — NEW MEXICO: Albuquerque — NEW YORK: Albany, Binghamton, Buffalo, Long Island City, Newburgh, Rochester, Saugerties, Syracuse, Woodside (L.I.) — NORTH CAROLINA: Charlotte — NORTH DAKOTA: Fargo — OHIO: Cincinnati, Cleveland, Columbus, Dayton, Toledo—OKLAHOMA: Oklahoma City, Tulsa—OREGON: Portland — PENNSYLVANIA: Bethlehem, Harrisburg, Philadelphia, Pittsburgh — RHODE ISLAND: Providence — SOUTH CAROLINA: Columbia — SOUTH DAKOTA: Sioux Falls — TENNESSEE: Chattanooga, Knoxville, Memphis, Nashville — TEXAS: Dallas, El Paso, Houston, Lubbock, San Antonio — UTAH: Salt Lake City — VIRGINIA: Richmond, Roanoke — WASHINGTON: Seattle, Spokane — WEST VIRGINIA: Clarksburg, South Charleston — WISCONSIN: Milwaukee — WYOMING: Casper



# Yes,

# Just a Piece of Wire

# BUT...

**upon its quality and fabrication depends the kind of wire rope service you will get.**

A. LESCHEN & SONS ROPE CO.
ST. LOUIS
PREFORMED
LESCHEN
"HERCULES"
RED STRAND
WIRE ROPE

**"HERCULES"***
**RED-STRAND**
*the* **DEPENDABLE**
**WIRE ROPE**
*for* **TOUGH JOBS**

* REG. U.S. PAT. OFF.

If this wire goes into a rope of the 6 x 19 Seale Construction with a fiber core, it will be just one of 114. But if it is a "HERCULES" (Red-Strand) Wire Rope, *every* one of the 114 wires will have been rigidly tested to make sure that it met, fully, our exacting standards as to *all* essential properties. Furthermore, the rope will have been designed and fabricated according to the most advanced methods of manufacture.

Only by the strict adherence to such principles can the highest quality in wire rope be produced — ***consistently.*** It is never a matter of chance.

Because of the exacting care and long experience always used in making "HERCULES" (Red-Strand) Wire Rope, you can depend on it for safe and economical service. As it is made in a wide range of construction — either Preformed or Non-Preformed, there is in this one grade, a "Right Rope" for any heavy duty job.

MADE ONLY BY

***We Invite Your Inquiries***

**A. LESCHEN & SONS ROPE CO.** **5909 KENNERLY AVE. • ST. LOUIS 12, MO.**

ESTABLISHED 1857

New York 6
Chicago 7
Birmingham 6
Houston 3
Denver 2
Los Angeles 21
San Francisco 7
Portland 9
Seattle 4

## IT ALWAYS PAYS TO SPECIFY

# LADISH

## *Controlled Quality*

## PIPE FITTINGS

6" STD. LADISH ELL © FTH

OPERATING STATEMENT

## ...When you judge by Operating Statements

Maximum strength and endurance to minimize shutdown losses and replacement costs . . . these are important operating economies you can trace directly to the laboratory safeguards of Ladish Controlled Quality. Advanced metallurgical controls over materials and forging methods assure complete dependability in every Ladish fitting.

L

TO MARK PROGRESS

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

**LADISH CO.**

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
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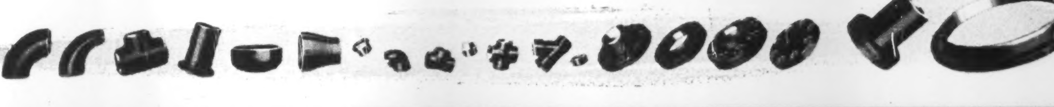


# MOLEHILL MAKER

## *Bearings Engineered By* **SKF**

"Caterpillar's" No. 12 Diesel Motor Grader casually slices through embankments, makes molehills out of mountains. It speeds up road construction and maintenance, shaves costs. It's powerful, speedy, economical, dependable.

Trouble due to friction is minimized by the use of **SKF** Spherical Roller Bearings.

Built-in alignment, equalized load distribution, high load carrying capacity are only part of the advantages contributed by **SKF**. For **SKF** specializes in helping put the right bearing in the right place.

Specify "Bearings by **SKF**" and get smooth performance, dependable service, economical operation and maintenance.

**SKF** INDUSTRIES, INC., PHILADELPHIA 32, PENNSYLVANIA—*the Pioneers of the Deep Groove Ball Bearing, Spherical Roller Bearing, Self-Aligning Ball Bearing.* 7148

**SKF**

**BALL AND ROLLER BEARINGS**

8 REASONS
WHY **SKF**
IS PREFERRED
BY ALL INDUSTRY

- Integrity
- Craftsmanship
- Metallurgy
- Tolerance Control
- Surface Finish
- Product Uniformity
- Engineering Service
- Field Service

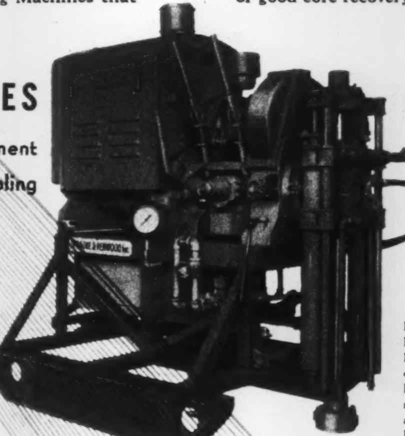
HEADQUARTERS FOR A COMPLETE WORLD-WIDE SERVICE IN EVERYTHING RELATING TO

# DIAMOND CORE DRILLING

**Sixty years of successful experience, backed by ample plant facilities and financial resources, enables us to manufacture Drilling Machines that can be relied upon for long periods of continuous high-speed operation with the greatest possible percentage of good core recovery.**

## DRILLING MACHINES

and Complete Accessory Equipment for Core Drilling and Dry Sampling



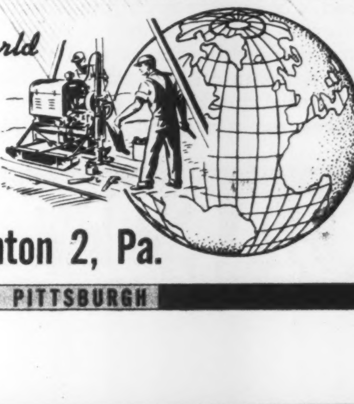
**Model 40-C Core Drilling Machine with Gasoline Engine Power Unit and oil-operated Hydraulic Swivel-head. Other Models are shown in our bulletins and in our "Mining Catalog" insert.**

## "TRUCAST" BORTZ DIAMOND BITS

**have proved their superiority for years in all types of rock formation. Set with any desired grade of bortz diamonds in a matrix of either copper or nickel alloy and available in a wide variety of standard and special types and sizes, ranging from 1-1/2" to 7-3/4" in diameter. Write for Bulletin No. 44-A.**

**MODERN design, rugged construction, liberal use of alloy-steel parts and anti-friction bearings throughout minimize time losses and operating expense. Swivel-head can be either "Screwfeed" or "Hydraulic". Power Unit can be either a gasoline or a Diesel engine, an air engine or an electric motor — each driving the Swivel-head and Hoisting Drum through a built-in four-speed sliding-gear transmission. A complete line of improved accessory equipment provides for every drilling and sampling requirement. Write for Bulletin No. 185.**

## CONTRACT DRILLING *anywhere in the world*

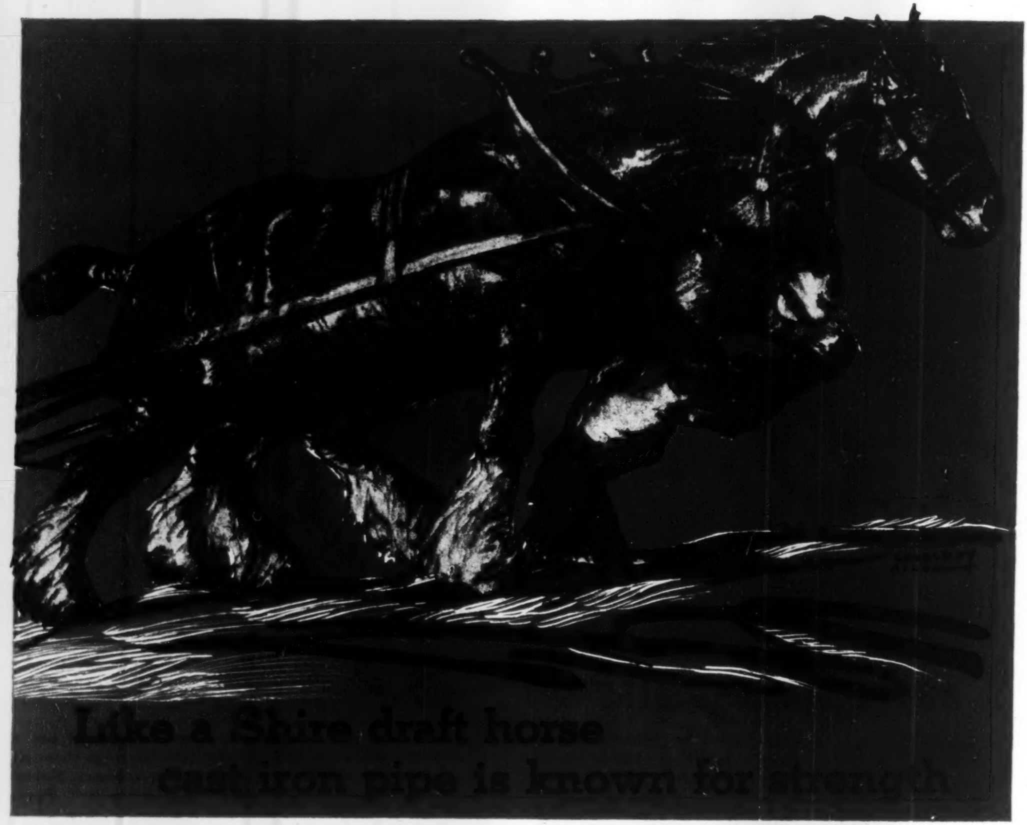


**Besides being manufacturers we are one of the largest contractors for any type of Diamond Core Drilling. This includes exploratory drilling for coal and ore, foundation-test drilling for bridges, dams and other heavy structures, grout holes and pressure grouting. Experienced crews and supervisors are available at all times — for service anywhere in the world. Estimates, and constructive suggestions whenever possible, submitted promptly on request.**

## SPRAGUE & HENWOOD, Inc., Scranton 2, Pa.

**Branch Offices: NEW YORK . PHILADELPHIA . PITTSBURGH**

# The STRENGTHS you need


Like a Shire draft horse
cast iron pipe is known for strength

**The strengths demanded of pipe to be laid under expensive modern pavements, if costly repairs and replacements are to be avoided, are known strengths—proved by experience and determinable by tests. The four strength factors that pipe must have to withstand beam stresses, external loads, traffic shocks and abnormal working pressures are listed on the opposite page. *No pipe, deficient in any of these strength factors, should ever be laid in paved streets of cities, towns or villages!* Cast iron water and gas mains, laid over a century ago, are serving today in the streets of 30 or more cities. These service records prove that cast iron pipe not only resists corrosion but has all the vital strength factors of long life and economy.**

# CAST IRON PIPE

# in pipe for city streets...

***No pipe that is deficient in any of the following strength factors should ever be laid under paved streets.***

## CRUSHING STRENGTH

**The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.**

## BEAM STRENGTH

**When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.**

## SHOCK STRENGTH

**The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times *on the same spot* from progressively increased heights of 6 inches.**

## BURSTING STRENGTH

**In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.**

CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

## SERVES FOR CENTURIES

WALWORTH
ALL STEEL HEAVY DUTY
Improved WALCO
TRADE MARK
PIPE WRENCH
JAWS AND NUT ZINC PLATED
TO RESIST RUST & CORROSION
ORTH
ANY
14
IMPROVED WALCO
PIPE WRENCH
14
50
PAT. PENDING

it's New!

it's Different!

## it's the strongest pipe wrench in the world!

## –the revolutionary Walworth improved Walco®

Yes, this is it . . . the NEW Walworth *Improved* Walco pipe wrench–with every part scientifically designed and tested by engineers for strength, safety and ease of operation. Its instant bite, and accurately determined center of gravity, combine with its inherent strength and minimum of weight to make it the fastest-working, easiest-handling, best balanced, heavy-duty pipe wrench available today . . . a wrench specially designed to minimize operator fatigue.

All parts are made of forged steel. The housing and handle are projection welded–a structural weld–to form an integral unit. Both jaws are carefully machined, and all parts are heat-treated to give extra toughness, uniformity, and strength. Every Improved Walco far exceeds the requirements for Federal Specification GGG-W-651a for Type II Heavy Duty Adjustable Pipe Wrenches.

A flexible, double-acting, easily replaceable spring–an exclusive patented Improved Walco feature–gives the wrench fast, positive ratcheting action!

Ask your Walworth distributor about the new, Improved Walco today! Heft the new, Improved Walco . . . feel its perfect balance–every part is guaranteed by the Walworth Company, doing business since 1842.

***Check these outstanding features***

**LIGHTER:** Housing and Handle are projection welded to form one integral unit.

**CORRECT BALANCE:** Accurate, the correct location of the center of gravity determined by test.

**STRONGER:** Heat treated to eliminate brittleness . . . cracking.

**FAST ACTING:** Scientifically designed spring action insures positive ratcheting action . . . quick bite.

**CALIBRATED PIPE SCALE:** Built-in scale permits speedy adjustment to pipe size.

**RENEWABLE PARTS:** All parts are readily obtainable, and easily replaced without special tools; thus prolonging service life indefinitely.

**RUST RESISTANT FINISH:** Entire wrench is rust resistant — Nut and Jaws have a special electroplated zinc coating.

**WALWORTH**

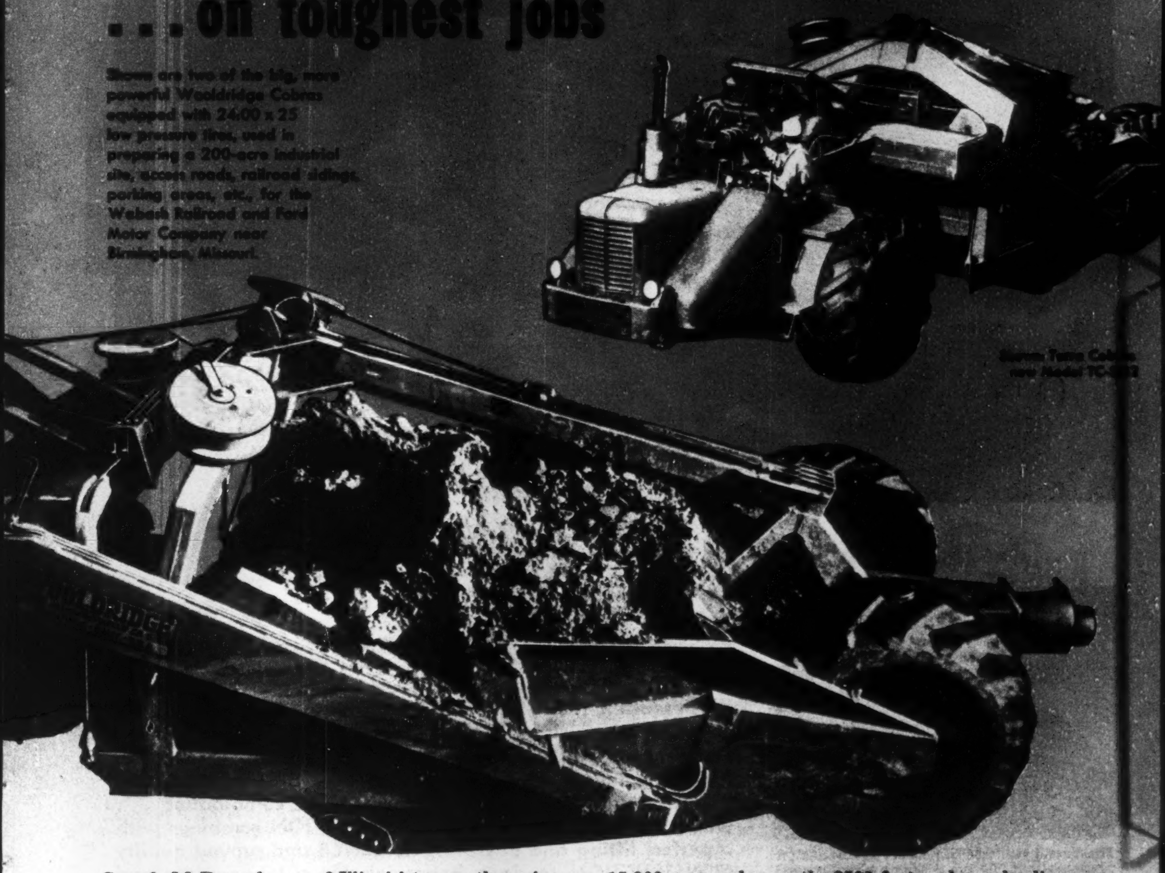
**valves...fittings...pipe wrenches**

**60 EAST 42nd STREET, NEW YORK 17, N. Y.**

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

# BIGGER PAY LOADS

## . . . on toughest jobs



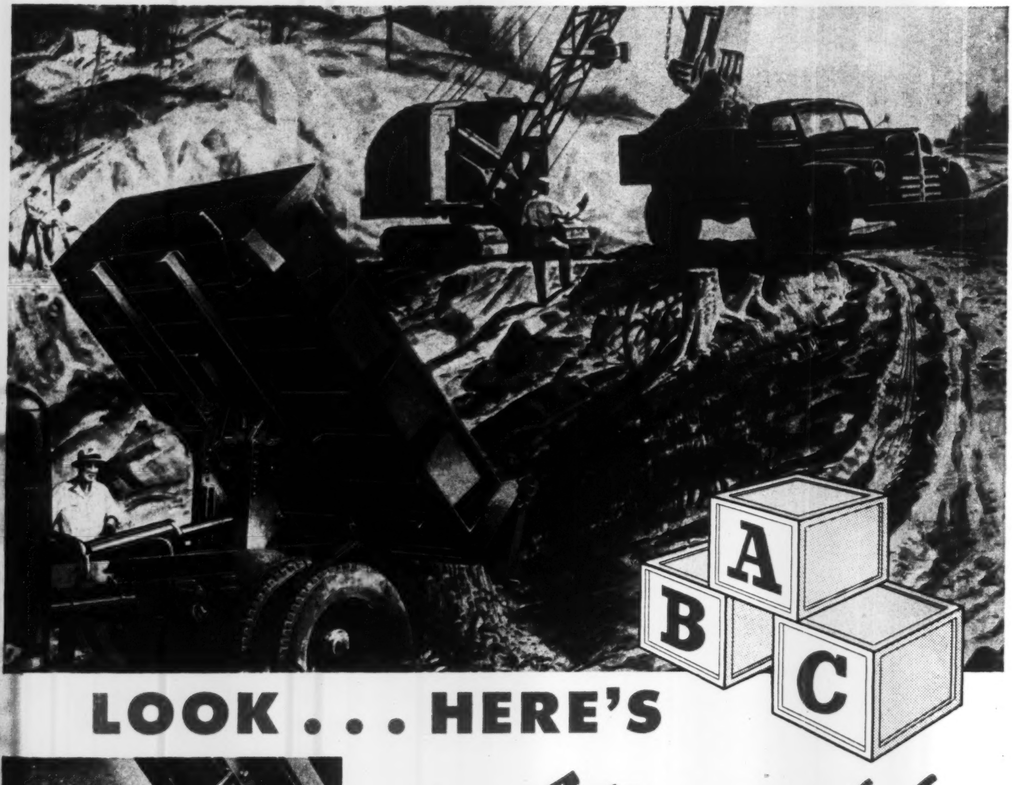
Shown are two of the big, more powerful Wooldridge Cobras equipped with 24:00 x 25 low pressure tires, used in preparing a 200-acre industrial site, access roads, railroad sidings, parking areas, etc., for the Wabash Railroad and Ford Motor Company near Birmingham, Missouri.

Shown: Terra Cobras new Model TC-S142

Swords-McDougal, one of Illinois' top earthmoving contractors, took on the job of moving 1,200,000 yards of tough, wet, sticky clay abounding in the hilly rocky Missouri River Valley region. Again, they turned to Wooldridge Terra Cobras. Job records justify their choice. Three new Model TC-S142 Cobras, and three 5-year-old Model TA Cobras still going strong, were put to work on grueling 20-hour-day schedules. The big new Cobras averaged 13 PAY YARDS per trip, with daily production exceeding 15,000 pay yards over the 2500-foot cycle . . . loading in 45 seconds, and discharging the sticky clay in less than 30 seconds. Performance like this spells profits . . . profits you can enjoy if you'll figure your next job on the basis of low-down-time, rugged stamina and high production of the greater new Wooldridge Cobra. Talk it over with your Wooldridge Distributor today . . . or write for the complete Cobra story now!

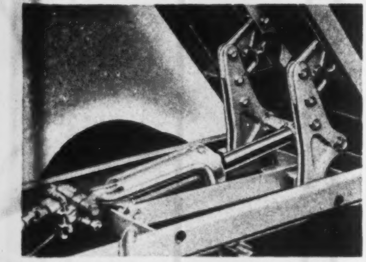
WOOLDRIDGE MANUFACTURING COMPANY
Sunnyvale, Calif. • 5345 N. Winthrop Ave., Chicago 40, Ill.

# WOOLDRIDGE



# LOOK . . . HERE'S

# *At work!*



Scientifically positioned fulcrums and transfer linkages automatically "shift" the load at different points, eliminating lift-shock and smoothing out lifting action throughout the dumping cycle.

It isn't often that you can actually see A B C at work . . . doing a job such as Galion's great A B C combination is "coming through" on here.

And Galion is the only producer of hydraulic hoists and allsteel dump bodies with this great A B C combination . . . where an exclusive fulcrumatic hoist ACTION combines with a perfect lifting and operating BALANCE and proved quality CONSTRUCTION to do a better job for a longer time and prolong chassis life as well.

So Get the Best . . . Get Galion when you need new dump truck equipment. It will pay Big!

**MAKES A WHALE OF A DIFFERENCE THE "WEIGH" IT LIFTS**

*Sales and Service*
FROM
*Coast to Coast*

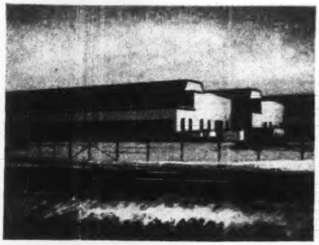
# GALION

**ALLSTEEL BODY COMPANY**
GALION, OHIO

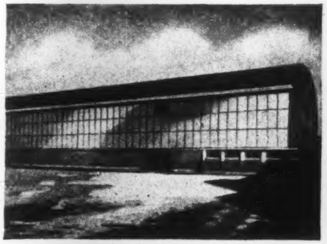
A exclusive hoist *Action*
B perfect operating *Balance*
C proved quality *Construction*

# From foundry to fieldhouse—you build faster and at lower cost with Cemesto*

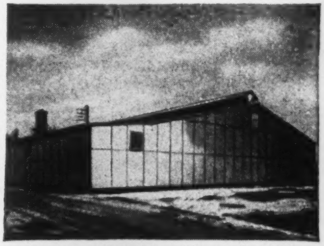
## Cemesto Panels give you insulated roof decks, curtain walls and partitions for but little more than the cost of uninsulated construction!



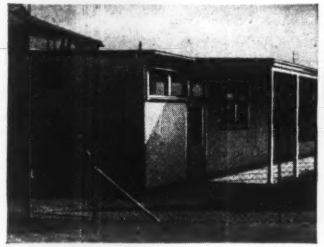
Foundry building of Cemesto Panels, Bucyrus-Erie Co., Milwaukee, Wisc. Archt.: Worden-Allen Co. Contractor: Permanent Const. Co.



Cemesto Panels used in University of Minnesota Winter Sports Arena. Architect: C. H. Johnson & Assoc., St. Paul. Contractor: Sauers Const. Co.



Practical, thrifty building of Cemesto Panels at The Ohio Mushroom Farm, Lima, Ohio. Contractor: F. H. Clausing of Lima.



Attractive, economical use of Cemesto Panels in the Alexander Hamilton Nursery School, one of 80 such units erected in Los Angeles, California.

U. S. Navy residence building of Cemesto Panels and brick masonry, erected in 1939 at Brooklyn, N. Y. Contractor: White Const. Co., New York City.

**Don't Stop that Job!**

. . . whether it's on the drawing board, or in the construction stage . . . you can assure uninterrupted completion of your job by specifying readily available Cemesto Panels in place of critical materials . . . NOW!

**Wherever and whatever you build,** chances are you can build it faster, easier, more economically . . . with Cemesto Insulating Structural Panels!

Their versatility permits important economies in the design, erection and maintenance of *permanent, insulated* structural roof decks, curtain walls and partitions. No wonder more and more engineers and contractors are specifying Cemesto Panels for industrial, commercial, institutional and defense emergency buildings of every type!

### Cemesto Panels Are Amazingly Versatile

Cemesto Panels consist of a core of Celotex cane fibre insulation, to which a *non-combustible* cement-asbestos facing is bonded on both sides by a vapor-resistant, moistureproof adhesive.

These rigid, pre-formed units are light and easy to handle. Yet they have remarkable structural strength! Their smooth, hard, stone-gray surfaces have a light reflection value of 58% . . . provide attractive exterior and interior finish. Left unpainted, Cemesto Panels are permanently maintenance-free. And their insulating core is protected by the exclusive (patented) Ferox* Process from fungus, dry rot, vermin and termites!

### Cemesto Panels Insulate As They Build

Due to their high *built-in* insulation value, Cemesto Panels make any building cooler, more economical to air condition in summer . . . warmer, thriftier to heat in winter. They promote more comfortable, healthier working conditions that pay off in improved employee efficiency, reduced accidents, increased production!

Cemesto Panels resist fire, weather and wear. Can be worked on the job with ordinary tools, or pre-cut at the mill for faster application. Quickly, easily attached to steel framing with metal clips, or to wood framing or wood members with nails. Easily demountable, *fully salvageable.*

Almost 21 years of varied use in all climates, all over the world, have proved the stability and permanence of Cemesto Panels. Discover how this modern marvel of building materials can help *you* build better, faster . . . and *at less cost . . . now!* Mail coupon below for complete information.

THE CELOTEX CORPORATION
120 S. LA SALLE ST., CHICAGO 3, ILLINOIS

MAIL COUPON TODAY!

*REG. U. S. PAT. OFF.

**CEMESTO**
REG. U. S. PAT. OFF.

**INSULATING STRUCTURAL PANELS**

The Celotex Corporation, Dept. ENR-31
120 S. La Salle St., Chicago 3, Illinois

Please send me FREE your 40-page Manual giving full technical data on Cemesto Panels, plus latest design and application recommendations. I am particularly interested in ☐ Curtain Walls ☐ Partition Walls ☐ Roof Decks.

Name..........

Address..........

City.......... Zone.......... State..........

# 2 BIG B Tournapulls

## on 5810′ haul at Enid Dam

## *W. G. Cook Construction Company*

of Jackson, Miss., with contract for 2,500,000 yards of dirtmoving at Enid Dam in the Yazoo Valley Basin Project, is speeding up production with big LeTourneau rubber-tired B Tournapulls.

To handle this large contract, W. G. Cook Construction Co. ordered two large electric-control B Tournapulls . . . drove them 150 miles from the LeTourneau factory at Vicksburg, Mississippi in just 12 hours . . . and put them right to work filling around the sluice ways. Recently, a careful time study showed these big units were getting heaped loads of sandy clay in less than a minute (average 57 seconds), spread their loads in less than half a minute (average 25 seconds). One-way haul was 5810′ with up grade sections of 250′ at 10%, 900′ at 6% and 300′ at 3%. The 240 h.p. "B's" completed this 11,620′ cycle in an average of 15 minutes for 4 trips each per 60-minute hour.

### 19 pay yards per load

Weighed loads averaged 55,183 lbs. net for 19 pay yards each, based on U.S. Engineers weight on material of 2900 lbs. per cubic yard. This was an increase of 70% over loads carried by 3 old-style Super C Tournapulls on the same job. These weighed out with 11.2 pay yards per load in the same material.

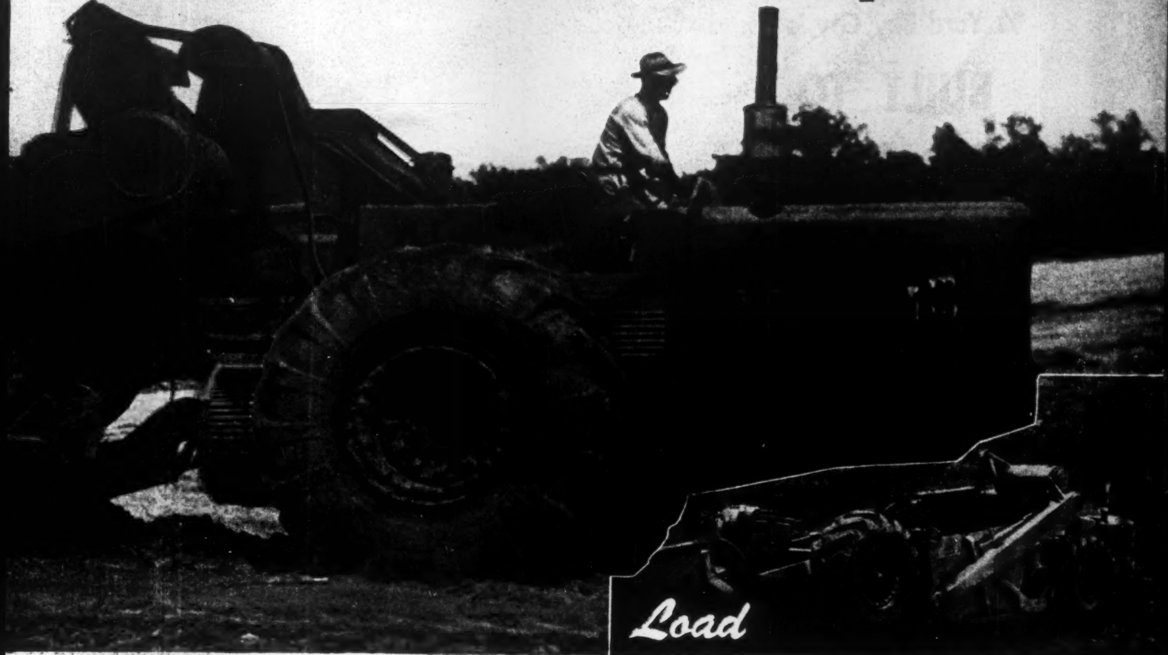
When you figure this output on basis of two 8-hour shifts per day, the plus for the Big "B" shows a very interesting profit margin over the Super "C", and, of course, any other type of scraper equipment.

### Performance earns repeat orders

It certainly looked that way to W. G. Cook Construction Company who ordered two more B Tournapulls shortly after the first "B's" showed their ability to perform consistently on the above basis. Cook also purchased three "C" electric-control Tournahoppers, and followed this with

**See your Le Tourneau Distributor NOW for complete information**

# deliver 152 pay yards per hour



Load

an order for two additional, for a total of five of these 15-yard bottom-dump haulers. In addition, W. G. Cook Construction Company has a new C Tournadozer, a fleet of Super C Tournapulls, together with Carryalls and LeTourneau Dozers on their crawler tractors.

## What operators say:

Next to performance records, perhaps one of the best ways to judge equipment is to listen to what the operators say about it. Marvin Eastman, one of Cook's certified operators, reports, "These electric 'Pulls are best in the field for backing up and maneuvering in a tight spot." W. F. Wyatt says, "When you get your load in, you know it will come out easy. I'm never tired at the end of the day . . . they're sure easy to operate." H. C. Valentine, another of the B Tournapull operators, sums it all up with, "Best piece of equipment I ever operated!"

Check economy of LeTourneau's BIG B Tournapull before bidding on any major earthmoving project. You'll find, with these modern high-production earthmovers, you have lowest-net-cost-per-yard figures to take the pick of the jobs at an attractive and safe profit. See your LeTourneau Distributor for complete facts and figures.

Haul

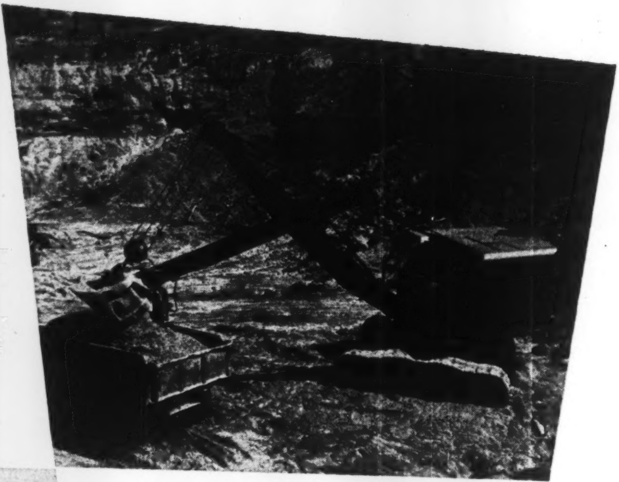
Spread

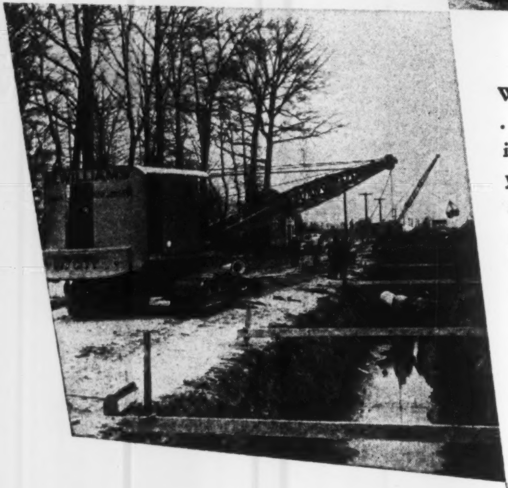
**LETOURNEAU** PEORIA, ILLINOIS JOB-PROVED Over 7050 Built and Shipped **TOURNAPULLS**

MORE YARDS PER HOUR WITH RUBBER-TIRED POWER

**To Give You Bigger Performance This ¾ Yard Bay City Is**

# BUILT TO BIG MACHINE PROPORTIONS



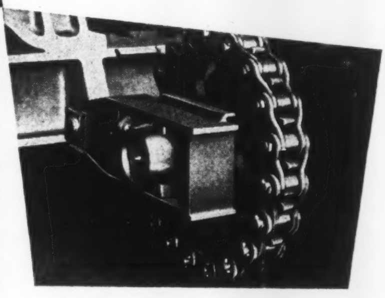


When you're in the market for a ¾ yard machine . . . look at the BAY CITY. You'll find one working near you and you'll find it to be a bigger ¾ yard machine that will give you bigger performance because it is built to big machine proportions. Power packed and nicely balanced, the Model 45 has a crane rating of 14 tons and weighs 22 tons as a shovel. It is fast and sturdy to give you that extra value which means larger profit possibilities. Why not write us for latest catalog or see your nearest BAY CITY dealer.

BAY CITY SHOVELS, INC.
BAY CITY, MICHIGAN

**✓ CHECK LIST**
- ✓ Fully Convertible
- ✓ Long, Wide Crawlers
- ✓ Alloy Cast Bases
- ✓ Tandem Drums
- ✓ Power Booster Clutches
- ✓ High Line Speeds
- ✓ Wide Vision Cab
- ✓ Pin-Connected Boom

The outboard bearing assembly — a standard BAY CITY design feature — is pivoted to the H-beam axle and provides a third bearing for the crawler drive shaft. A short, sturdy adjusting bolt, locked in position, is in compression at all times and is shielded by a grease filled pocket. Forged adjusting boxes have bronze bearings arranged with grease pockets which prevents entrance of dirt.



182

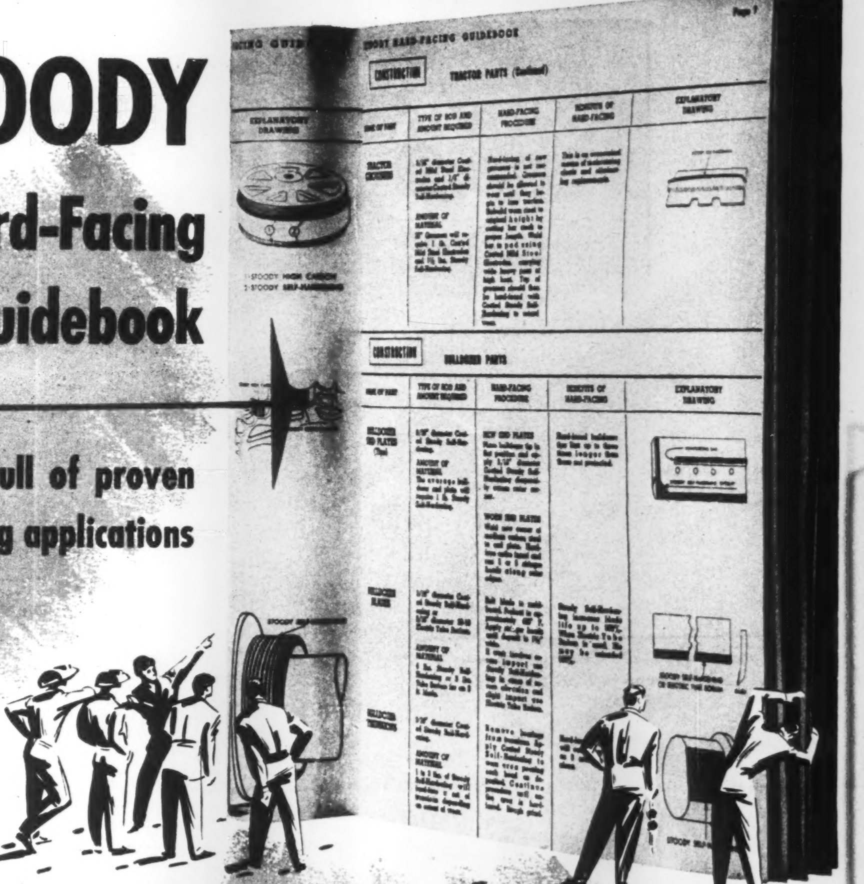
# BAY CITY

**SHOVELS • CRANES • HOES • DRAGLINES • CLAMSHELLS**

# STOODY

## Hard-Facing Guidebook

**chock full of proven hard-facing applications**


Page 7
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TRACTOR PARTS (Continued)
EXPLANATORY DRAWING
CONSTRUCTION
BULLDOZER PARTS
EXPLANATORY DRAWING

Stoody
HARD-FACING
GUIDEBOOK
FOR EQUIPMENT USED IN

## a valuable aid to maintenance men!

A lot of hard-facing success is in the use of correct alloys applied in the right way. If you want to eliminate failures, gain utmost life increase and savings in equipment dollars—get your copy of the STOODY HARD-FACING GUIDEBOOK!

Clear, concise descriptions of each hard-facing application provide the all-important know-how for common earth handling-crushing-mixing equipment in your industry. It costs you nothing—may provide the answers to more economical operation, fewer equipment breakdowns, more profit!

Simply ask for the "STOODY HARD-FACING GUIDEBOOK" on your letterhead; it will be mailed post-paid to your personal attention. *But it can't help you until it's in your hands—Write today!*

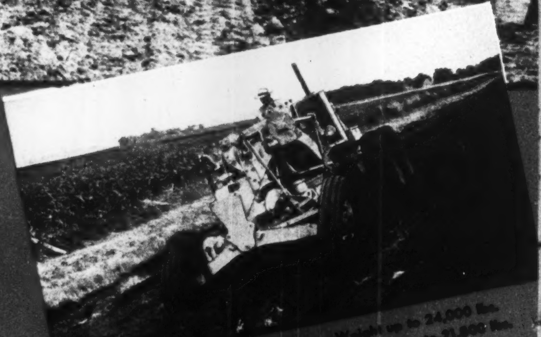
**STOODY COMPANY**

11976 EAST SLAUSON AVENUE, WHITTIER, CALIFORNIA

# 5 BIG REASONS

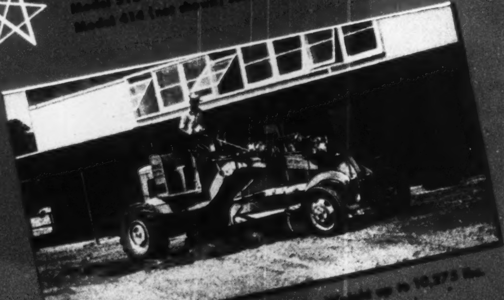
Model 610—100 H.P. Diesel Engine—
Weight up to 27,000 lbs.

Model [illegible]—100 H.P. Diesel Engine—Weight up to [illegible] lbs.



Model 512—76 H.P. Diesel Engine—Weight up to 24,000 lbs.
Model 414 (not shown) same engine—Weight up to 21,800 lbs.

Model 312—70 H.P. Diesel Engine—Weight up to 19,820 lbs.
Model [illegible] (not shown)—90 H.P. Gas Engine—Wt. up to 19,500 lbs.



Model 201—31 H.P. Gasoline Engine—Weight up to 10,275 lbs.

# WHY *Adams Motor Graders are your best buy*

1 **8 Overlapping Forward Speeds . . . Flexible working range speeds work—increases output—provides high transport speeds.**

2 **Wide Range of Blade Positions—Without Mechanical Adjustments . . . Saves Time in Adapting Machine to Needed Cuts.**

3 **Positive-Action Mechanical Controls . . . Dependable, accurate adjustments—because they're geared . . . Easy, natural steering.**

4 **Ample Operating Clearances . . . Quick, easy adaptation to work . . . Operator comfort, convenience, efficiency.**

5 **Fast, Easy, Servicing Plus World-Wide Dealer Service . . . Saves time and money.**

Adams Motor Graders—*and only Adams*—offer owners this important and exclusive combination of advantages.

Each and every one of these advantages is in itself a highly desirable feature . . . and together they combine to give you the fastest, smoothest performing, most flexible and dependable motor graders on the market—*bar none!*

What's more, all Adams Motor Graders—from the very largest machine to the smallest—are of the same tried and proved design—all capable of the same wide range of work, in proportion to their size and power.

Big operator or small—highway official or contractor—you'll find in the *All-Star* Adams Motor Grader team a machine perfectly suited to your requirements and budget . . . a machine with the *right power* and *right capacity* to meet your individual needs exactly.

Ask your local Adams dealer for complete information on these great all-year, all-purpose machines.

J. D. ADAMS MANUFACTURING COMPANY · INDIANAPOLIS, INDIANA

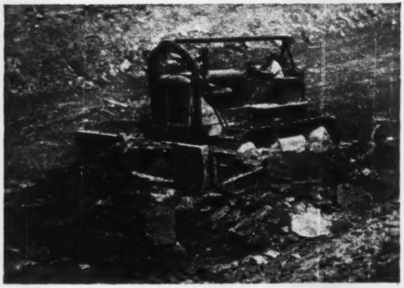
Motor Graders

TraveLoaders

Pull-Type Graders

**Adams**

# HYATTS help build highways



BUYERS and builders of road construction equipment agree on the vital importance of roller bearings that can take tough treatment on the job.

That's why so many manufacturers of tractors . . . trucks . . . ditch-diggers . . . power-shovels . . . graders . . . road-rollers and other equipment "build in" Hyatt Roller Bearings.

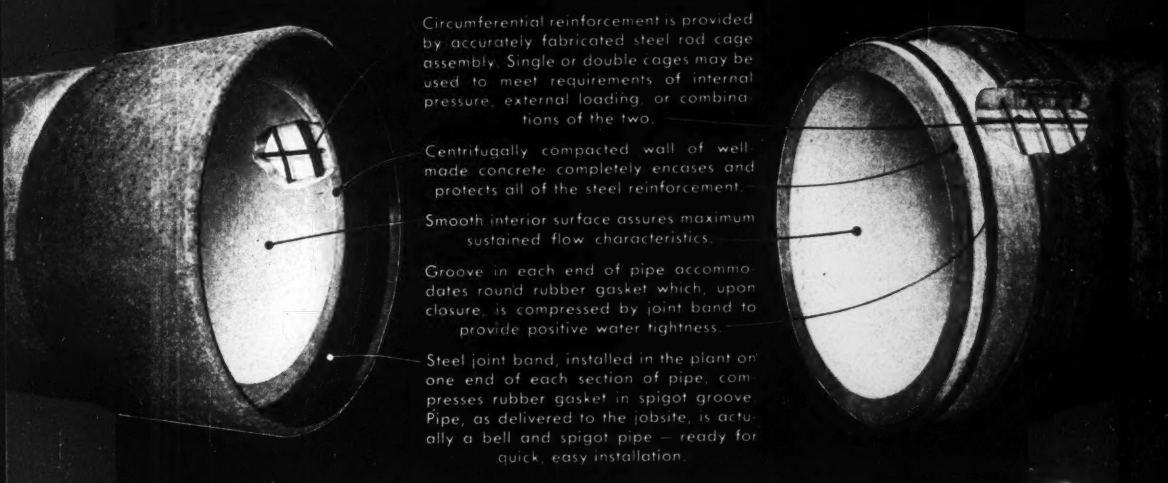
Years of actual experience have proved that Hyatts are the rugged, dependable, quality bearings that *serve* and *last* with a minimum of care.

So with Hyatt-equipped products enjoying longer life and cutting cost of machine operation, it's to your advantage always to look for Hyatts in the specifications. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

**HYATT ROLLER BEARINGS**

# Could the dependable qualities of this pipe help you reduce the cost of delivered water?

**Centrifugally spun, reinforced concrete pressure pipe with double rubber gasket joints combines strength of steel with permanence of concrete.**



Circumferential reinforcement is provided by accurately fabricated steel rod cage assembly. Single or double cages may be used to meet requirements of internal pressure, external loading, or combinations of the two.

Centrifugally compacted wall of well made concrete completely encases and protects all of the steel reinforcement.

Smooth interior surface assures maximum sustained flow characteristics.

Groove in each end of pipe accommodates round rubber gasket which, upon closure, is compressed by joint band to provide positive water tightness.

Steel joint band, installed in the plant on one end of each section of pipe, compresses rubber gasket in spigot groove. Pipe, as delivered to the jobsite, is actually a bell and spigot pipe — ready for quick, easy installation.

**Appearance of bell and spigot ends just prior to closure. Inside and outside annular spaces are completely filled with cement mortar.**

In recent years, development by this company of the Double Rubber Gasket Joint for centrifugally spun pipe has greatly increased its versatility and adaptability. It is proving outstandingly successful in a wide variety of installations throughout the West. Here are typical examples:

Coachella Valley County Water District, Coachella, Calif. (U.S. Bur. of Reclamation Project), Units 5, 6 and 7—270,000′, 12″ thru 72″; operating heads up to 75′.

Olympia, Wash. (McAllister Springs Water Supply Line) 35,000′, 36″; operating head, 150′ max.

San Diego County Water Authority (San Diego Aqueduct—Sweetwater Extension) 23,500′, 18″–24″; operating heads up to 130′.

*Available in diameters from 12″ through 84″, and for moderate operating heads (generally up to 125′), this pipe is another example of American's ingenuity and skill in the development of better products for water supply lines. Further information is available upon request.*

**American**
**PIPE AND CONSTRUCTION CO.**

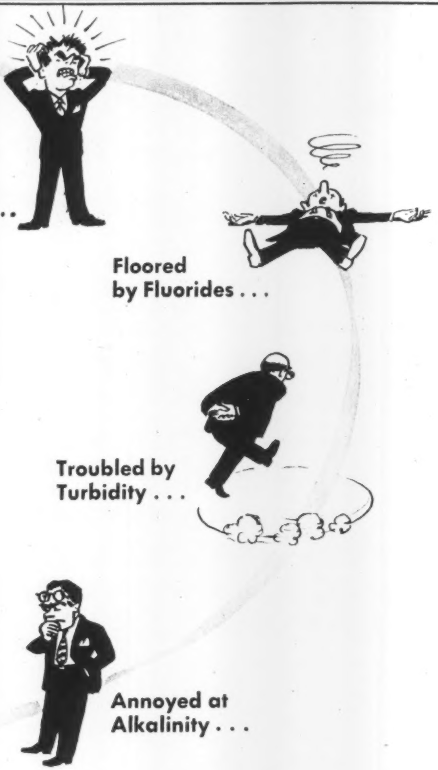
*Concrete Pipe for Main Water Supply Lines, Storm and Sanitary Sewers, Subaqueous Pipe Lines.*

**P. O. Box 3428, Terminal Annex • Los Angeles 54, California**

QUALITY PIPE LINE PRODUCTS MANUFACTURED AND INSTALLED BY AMERICAN INCLUDE HUME CENTRIFUGAL CONCRETE PRESSURE PIPE, AMERICAN CONCRETE CYLINDER PIPE, PRESTRESSED LOCK JOINT CONCRETE CYLINDER PIPE, LOCK JOINT CONCRETE CYLINDER PIPE.

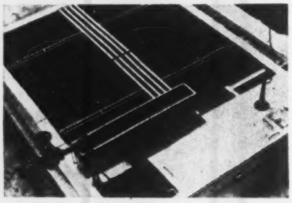
**Main Offices and Plant—4635 Firestone Boulevard, South Gate, California — District Sales Offices and Plants — Oakland — San Diego — Portland, Oregon.**

# *Men with WATER ON THE BRAIN . . .*



Is there something wrong with your town's water supply? Hardness? Turbidity? Silica? Alkalinity? Fluorides? Color? Taste? Odor? If you are plagued by any one of them, it's a good idea to specify Permutit water conditioning equipment.

## — *should know about the* PERMUTIT PRECIPITATOR!



The Permutit Precipitator brings you a new and more efficient means for removing impurities from water. It does this by precipitation, adsorption, settling and upward filtration. Its sludge blanket is kept fresh and active at all times. The Precipitator requires less space, less time and less chemicals than previous designs of reaction and settling tanks.

Write today for full information about this economical equipment to The Permutit Company, Dept. ENR-3, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

Water Conditioning Headquarters for Over 37 Years

**PERMUTIT**

"Washington calling!"

We were expecting this call. In a sense it is the people of America on the other end of the telephone. For some time they have been calling upon our government to take whatever steps are necessary to equip our fighting men for any job they may have to do.

Korea has proved the fallacy of limited preparedness. You know now that the nation is girding for survival. The people of America have said—and rightly—that private industry should provide the Armed Forces with whatever is necessary.

Machines are being mobilized. "Caterpillar" products are wearing olive drab once more. Because of large military demands your present machines may have to work longer than you had anticipated.

You can get many extra hours of machine service life if you:

1 Follow a sound program of operation and maintenance.

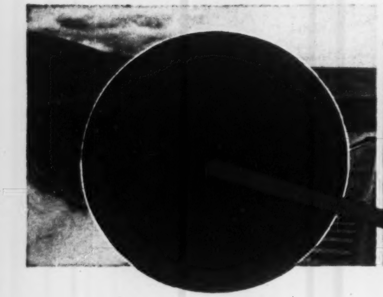
2 Consult your Operator's Instruction Book, using it as a constant guide in caring for your machines.

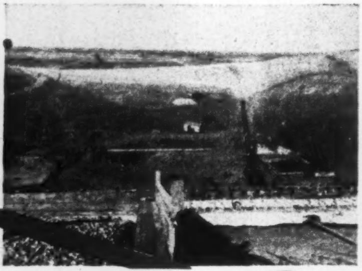
3 Secure the assistance of your "Caterpillar" dealer who now, more than ever before, is your working partner for the grim job that may lie ahead.

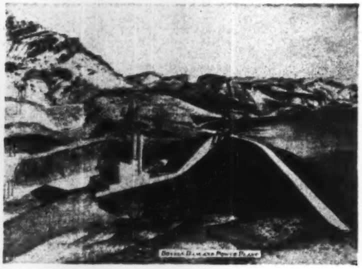
• • •

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

**CATERPILLAR**
REG. U. S. PAT. OFF.
**Diesel Engines • Tractors • Motor Graders • Earthmoving Equipment**



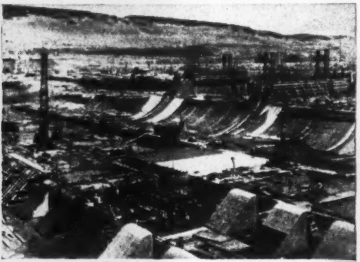


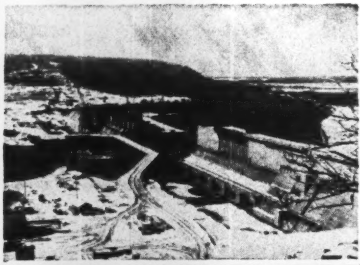


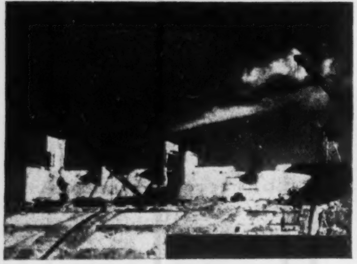
# Protex

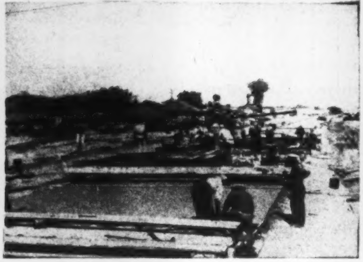
*America's leading air entraining solution*

**is used on more large projects (and many smaller ones) throughout the world, because Protex concrete is more durable, easier to place and more workable.**









Specify...
always buy...
Protex
Air Entraining
Solution

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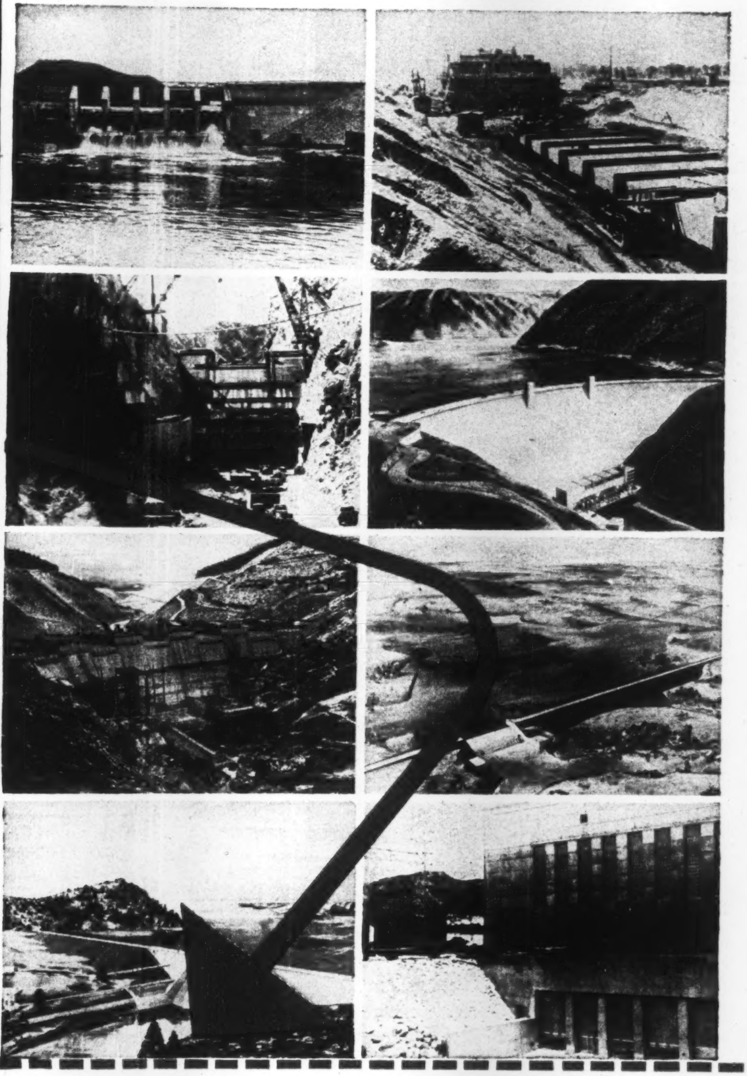

**This is a partial list of Protex projects:**

Morrison-Knudsen Co., Inc.,
Shoshoni, Wyo.
Boysen Dam, U. S. Bureau of Recl.

Johnson-Winston-Kiewit, Contractors,
Fort Gibson, Okla.
Fort Gibson Dam (490,000 yds.)
U. S. Corps of Engineers

Harlan Construction Co., Alma, Nebr.
Harlan County Dam (430,000 yds.)
U. S. Corps of Engineers

Al Johnson Construction Co.,
Denver, Colo.
Cherry Creek Dam,
U. S. Corps of Engineers

Lytle-Amis Construction Co.,
Cambridge, Nebr.
Medicine Creek Dam
U. S. Bureau of Recl.

Hubert H. Everist, Sr., Contractor,
Westley, Calif.
Delta Mendota Canal,
U. S. Bureau of Recl.

Mason Construction Co., Tulisheek, La.
Pearl River Lock No. 1,
U. S. Corps of Engineers

McNary Dam Contractors
Plymouth, Wash.
McNary Dam (760,000 yds.)
U. S. Corps of Engineers

Mittry Brothers Construction Co.,
Hulah, Okla.
Hulah Dam, U. S. Corps of Engineers

Peter Kiewit & Morrison-Knudsen,
Estes Park, Colo.
Colorado Big Thompson Project,
U. S. Bureau of Recl.

Lytle & Green Construction Co.,
Glen Ullin, N. D.
Heart Butte Dam, U. S. Bureau of Recl.

T. L. James & Co., Bush, La.
Pearl River Lock No. 2,
U. S. Corps of Engineers

Peter Kiewit & Sons Co., Fresno, Calif.
Friant-Kern Canal,
U. S. Bureau of Recl.

Dorena Construction Co.,
Cottage Grove, Ore.
Dorena Dam, U. S. Corps of Engineers

Guy Atkinson Co., Inc.,
Walla Walla, Wash.
Mill Creek Project
U. S. Corps of Engineers

Utah Construction Co.,
Hot Springs, S. D.
Angostura Dam,
U. S. Bureau of Recl.

Morrison-Knudsen Co., Inc.,
Casper, Wyo.
Kortes Dam, U. S. Bureau of Recl.

Guy Atkinson & J. A. Jones Cons. Co.,
Hanford, Wash.
U. S. Atomic Energy Plant,
U. S. Corps of Engineers

Morrison Knudsen & M. H. Hasler,
Tracey, Calif.
Delta-Mendota Canal,
U. S. Bureau of Recl.

Gordon-Bressi-Bevanda,
Estes Park, Colo.
Estes Park Dam, U. S. Bureau of Recl.

A. L. Alley & Son, Contractor
Pickstown, S. D.
Fort Randall Dam (paving work),
U. S. Corps of Engineers

Adler Construction Co., Madras, Ore.
Dickinson Dam, U. S. Bureau of Recl.

Horner & Switzer Construction Co.,
Hale, Colo.
Bonney Dam, U. S. Bureau of Recl.

Young & Smith Construction Co.,
Paonia, Colo.
Paonia Dam, U. S. Bureau of Recl.

S. B. H. U. Co., Hot Springs, Ark.,
Bailey Mountain Tunnel,
U. S. Corps of Engineers

U. S. Engineers, Fort Peck Dam

McCarthy Improvement Co.,
Pickstown, S. D.
Fort Randall Dam,
U. S. Corps of Engineers

Al Johnson Construction Co.,
Pickstown, S. D.
Fort Randall Dam,
U. S. Corps of Engineers

Silas Mason Co., Pickstown, S. D.
Fort Randall Dam,
U. S. Corps of Engineers

S. A. Healy, Riverdale, N. D.
Garrison Dam,
U. S. Corps of Engineers

Adler Construction Co.,
Dickinson, N. D.
Dickinson Dam, U. S. Bureau of Recl.

Peter Kiewit & Morrison-Knudsen,
Riverdale, N. D.
Garrison Dam,
U. S. Corps of Engineers

Hamilton, Williams & Noonan,
Beaumont, Texas
Neches River Dam,
U. S. Corps of Engineers

Consolidated Builders, Inc.,
Mill City, Ore.
Detroit Dam,
U. S. Corps of Engineers

T. L. James Co., Contractors,
Fort Worth, Texas
Fort Worth International Air Port

General Shea-Morrison,
Hungry Horse, Mont.
Hungry Horse Dam (3,100,000 yds.)
U. S. Bureau of Recl.

AUTOLENE LUBRICANTS CO.
1339 WEST EVANS AVE.
DENVER, COLO.

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k, N. J. • Arthur H. Harris Co., New Britain, Conn. • Metalweld Inc., Philadelphia, Pa. • Builders Equip. & Supplies Co., West Medford, Mass. • O. B. Avery
atchewan, Canada • Western Tractor & Equip. Co., Saskatoon, Saskatchewan, Canada • Japan Overseas Commercial Co., Ltd., Chuo-Ku, Tokyo, Japan.

T. R. Griest, architect
Roy A. Finney, designer,
consulting engineer

# FOR WATER TANKS OF DISTINCTION CHOOSE *CONCRETE*

A WELL-DESIGNED concrete water tank such as the 2,000,000 gal. municipal water tank in Topeka, Kan., shown above, not only has long-lasting utility but also unusual beauty that makes it an outstanding landmark in the community.

Any city, large or small, can obtain lasting benefits by building such a reinforced concrete water tank. Its sturdy construction gives it the durability to withstand the weathering action of any climate. Its enduring beauty makes it a structure of which the entire community always can be proud.

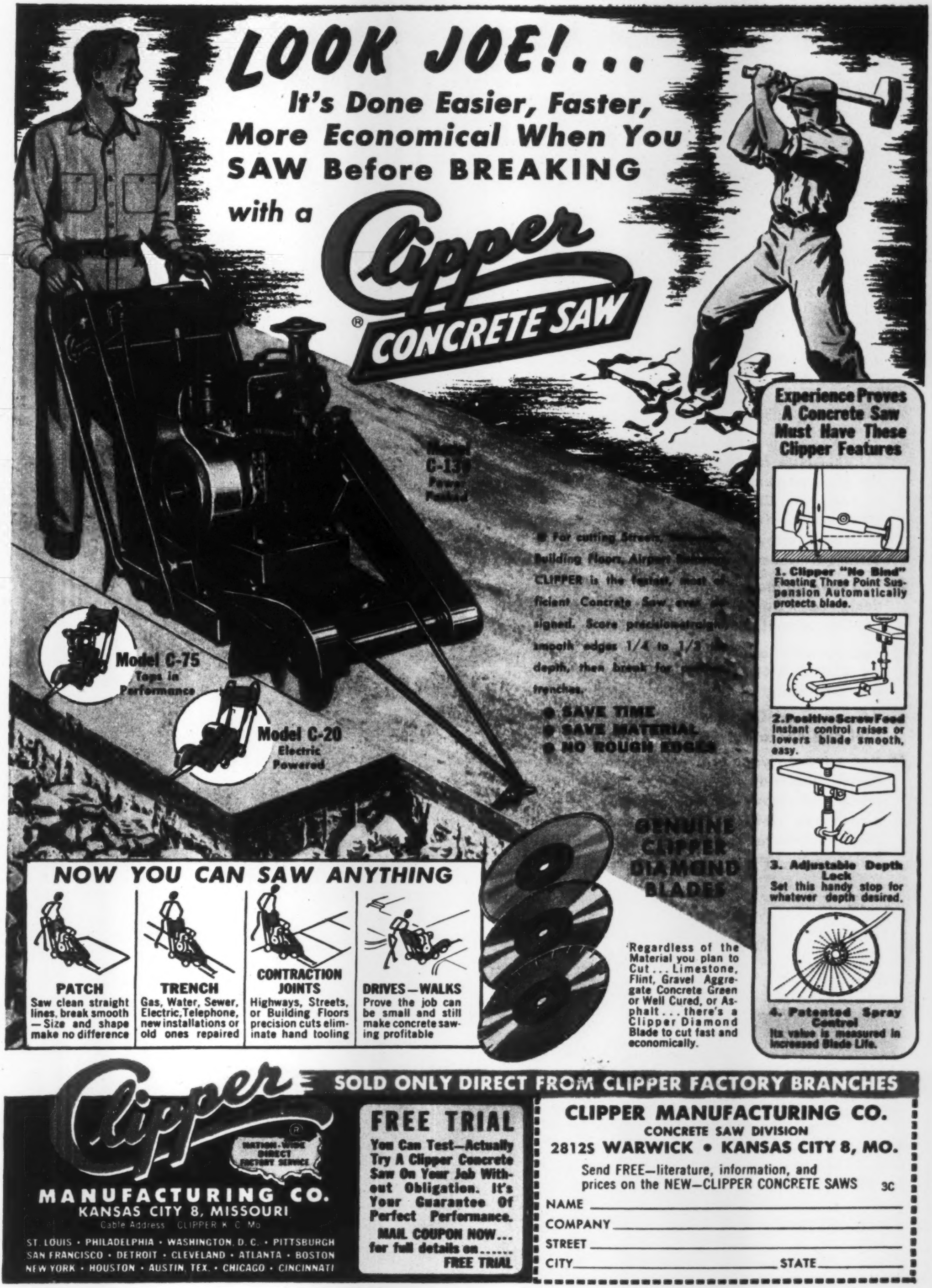
A reinforced concrete water tank can be erected in practically any location without marring the skyline or depreciating the appearance or value of the property in the area.

Best of all, reinforced concrete water tanks are more economical than other types. They require little or no maintenance. They retain their distinctive appearance over their long life. And they render ***low-annual-cost*** service—the true measure of construction value. Such service pleases taxpayers, engineers and municipal officials alike.

**PORTLAND CEMENT ASSOCIATION**

33 WEST GRAND AVENUE, CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work



# LOOK JOE!...

## It's Done Easier, Faster, More Economical When You SAW Before BREAKING

## with a Clipper® CONCRETE SAW

Model C-130 Power Pushed

Model C-75 Tops in Performance

Model C-20 Electric Powered

● For cutting Streets, [illegible] Building Floors, Airport Runways, CLIPPER is the fastest, most efficient Concrete Saw ever designed. Score precision-straight, smooth edges 1/4 to 1/3 the depth, then break for patches, trenches.

- SAVE TIME
- SAVE MATERIAL
- NO ROUGH EDGES

GENUINE CLIPPER DIAMOND BLADES

Regardless of the Material you plan to Cut ... Limestone, Flint, Gravel Aggregate Concrete Green or Well Cured, or Asphalt ... there's a Clipper Diamond Blade to cut fast and economically.

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Saw clean straight lines, break smooth — Size and shape make no difference

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Highways, Streets, or Building Floors precision cuts eliminate hand tooling

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Prove the job can be small and still make concrete sawing profitable

### Experience Proves A Concrete Saw Must Have These Clipper Features

**1. Clipper "No Bind"** Floating Three Point Suspension Automatically protects blade.

**2. Positive Screw Feed** Instant control raises or lowers blade smooth, easy.

**3. Adjustable Depth Lock** Set this handy stop for whatever depth desired.

**4. Patented Spray Control** Its value is measured in increased Blade Life.

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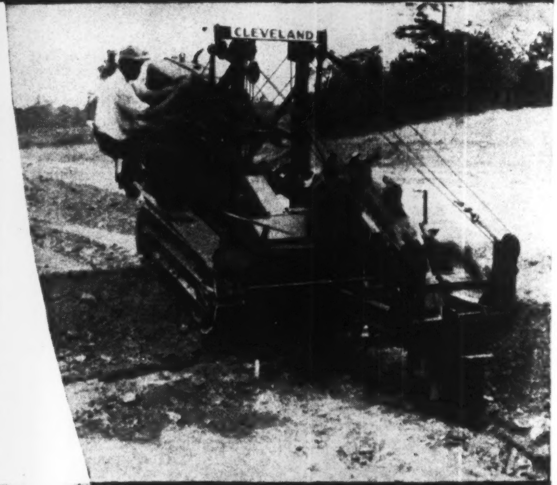
*Here's how you*

# CUT TRENCH COST

# 5

# WAYS



- You save on your equipment investment. CLEVELANDS longer service life is proved by the high percentage of early CLEVELANDS still in daily use. CLEVELANDS fast jumps between jobs and their famous versatility and wide range of trench sizes mean more work—and more different kinds of work—with fewer machines.
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*with*

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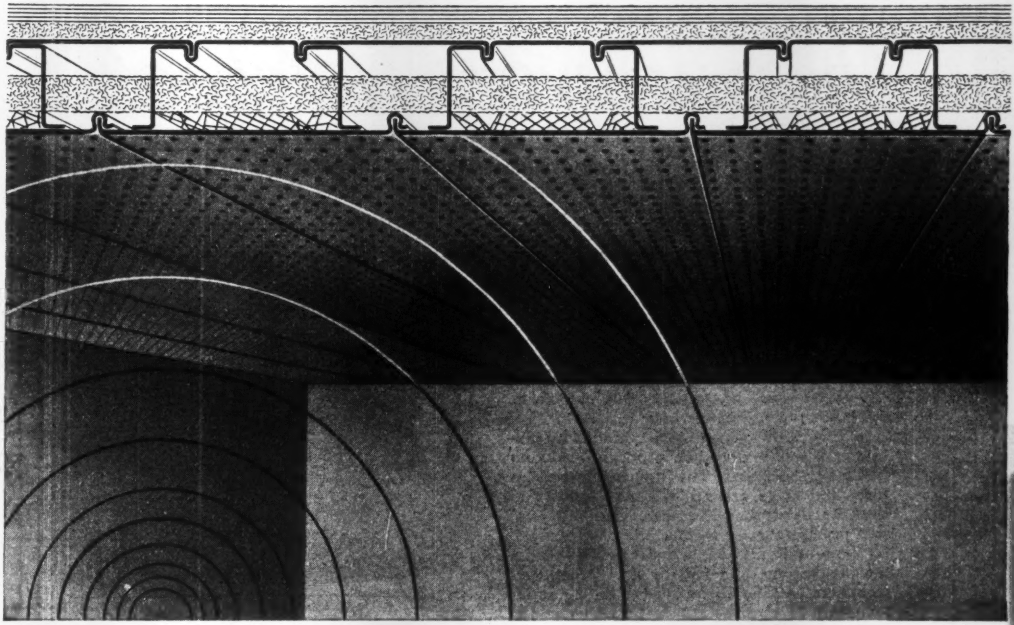


# Ceiling, Silencer, Floor or Roof— One Economical Package

It soaks up sound. It's structural material. It's ceiling and subfloor—or ceiling and roof. It's incombustible. You can smack its perforated bottom . . . or paint it . . . without hurting it, or its acoustical efficiency, a bit.

It's the new Fenestra* Acoustical "AD" Building Panel with a sound reduction coefficient of 0.80! Speedily and easily erected, these long-span panels are going into plants, schools, theaters, churches, hospitals, stores all over the country . . . because they save time, labor, materials and money. They're another standardized Fenestra Product engineered to cut the cost of building.

**HERE'S A BRIEF DESCRIPTION OF THE FENESTRA "AD" PANEL PACKAGE:**

**Size:** 6′ to 24′ long, 16″ wide, 3″, 4½″, 6″ and 7½″ deep. 16 to 13-gage USS Steel.

**Elements:** Cellular panel.
⅛″ holes, 946 per square foot, in bottom surface. Wire-chair insulation support. 1″ thick, 4¼-lb. density glass fibre sound insulation, coated one side. 16-gage cover plates for top.

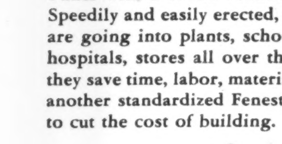
Fenestra has made similar acoustical-structural products for 20 years and is a member of Acoustical Materials Assn.

Send coupon for specifications, load tables, installation details, etc. Or call your Fenestra Representative (listed in yellow pages of phone book).

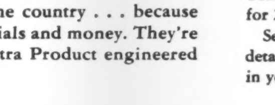
*Trademark

**Fenestra** **PANELS • DOORS • WINDOWS**

*engineered to cut the cost of building*



**Interlocking "C" Insulated Panels for all walls. Standard width 16". Depth 3". Gage steel 18 USS, alum. 16 B&S. Exterior alum. face ribbed or plain.**



**Interlocking "D" Panels for smooth strong floors and long-span roofs. Standard width 16". Depths 1½" to 7½". Gages 18 to 12.**

DETROIT STEEL PRODUCTS COMPANY
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Dept. ER-3, 2277 E. Grand Boulevard
Detroit 11, Michigan

Please send me, without obligation, information on Fenestra Building Panels.

Name____________________

Company____________________

Address____________________

# The Surveyor's Notebook

Reporting on Unusual Surveying Problems and Their Solutions

Notekeeper: W. & L. E. Gurley, America's Oldest Engineering Instrument Maker

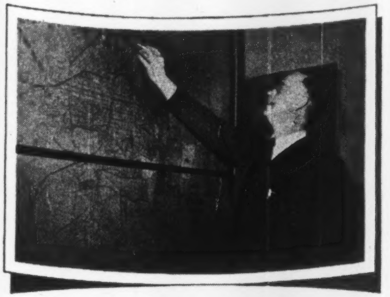
## Is Polaris on Your Parties?

"Next time you're afraid that errors may be piling up along your line, call on the north star to set you straight," suggests William E. Weigle, City Engineer of York, Pennsylvania. "Every surveyor knows the value of Polaris, but too few of us actually use it."

"A few years ago, we were hounded by taxpayers, trying to find their property's relation to the city boundary. The line was last run in 1888, and large areas had been annexed to York since that time. Confusion was mounting, so a precise survey seemed the only answer.

"We found only four stones surviving from the old survey, and had to start practically from scratch. The line proved to be 11.4 miles long with 77 *changes of direction.* Obstacles—natural and man-made—faced us all along the way, so we feared that error might be creeping into the work. But, by taking observations on Polaris, we saved ourselves considerable grief.

"Wanting to use the star at elongation—to take advantage of the 20 minutes when total changes in azimuth is only six seconds—we checked our Gurley *Ephemeris;* and made the first observation after midnight, in below-freezing weather. This result was carried to another point about two and one-half miles distant in longitude, where a second observation was made. Allowing for convergence of meridians, we found the bearings did not agree. Checking computations pinned down the error...saved carrying it around the city.



"In all, we made five observations—the last, fortunately, on a much warmer evening in spring. Through these observations—and good instrument work—the survey was closed without any angular error."

### Two Jobs—A Gurley on Each

Bill Weigle works five and a half days a week at his job in York City Hall. In spare time, he continues a private civil engineering practice in which two sons, Robert and Donald, will join him after graduation from the Rensselaer Polytechnic Institute.

On both the city job and in private work, Weigle uses Model 132-R Gurley Transits—one, a "minute gun"; the other, "20 seconds." Weigle says, "The two *dependables* — the north star and a Gurley Transit—make a team any engineer can count on for his most accurate work."

Take a tip from Bill Weigle. Investigate versatile Gurley Transits. For complete details, write for Bulletin 50.

Bill Weigle carries a plastic refrigerator bag in his instrument case; slips it over his transit during flash rains in the field... Send us your problem-solution and/or a tip for this space.

**W. & L. E. GURLEY, UNION PLAZA, TROY, N. Y.**

Surveying and Engineering Instruments, Hydraulic Engineering Instruments, Standard Precision Weights and Measures, Paper and Textile Testing Instruments, Reticle Making Facilities, Aeronautical Navigating Instruments, Meteorological Instruments.

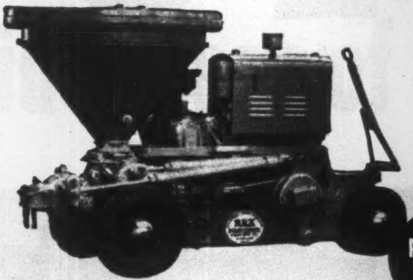
**GURLEY**

Surveying and Scientific Instrument Makers

Since 1845

# You'll profit from these "cutting remarks"

**. . . on how Rex Pumpcrete® and pipe line flexibility cut concrete placement costs on buildings of all types.**



### pumpcrete CUTS direct labor cost

Concrete is transported, elevated and placed in one operation. No rehandling . . . no buggying needed.

### pumpcrete CUTS preparatory costs

Pumpcrete and pipe line flexibility eliminate need for many access structures such as road building and maintenance . . . towers and scaffolding, etc.

### pumpcrete CUTS "dead time"

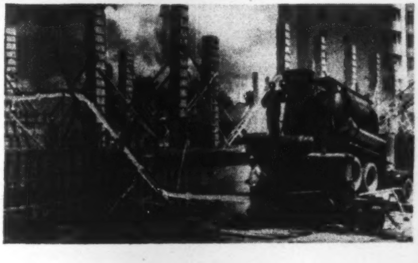
Delivers concrete in a steady flow. Often eliminates overtime caused by crews having to wait to avoid interfering with placement operations.

### pumpcrete CUTS non-productive moving time

No need to move mixing equipment from place to place. Spot Pumpcrete in the one best location for concrete delivery.

## *Just Look at these examples!*

**Here Pumpcrete is being used to place all concrete on a four-story steam generating plant. On this job there are many big pours in a small area. An important advantage of the Pumpcrete is its steady pumping which permits small crews to handle large volumes with little dead time. Better scheduling of all operations on the job is possible. Overall efficiency is greatly increased.**



**On this job the Pumpcrete, being charged by a Rex Hi-Discharge Moto-Mixer, pours the flooring of a large apartment building. An important advantage here was the fact the steel setting and forming crews were able to erect the tall column forms shown without interference from the concreting crews pouring the slab. Columns were poured when second floor was constructed.**

**Nine stories high . . . 160 feet up! That's how high the Rex Pumpcrete lifted the concrete on this building job. Pumpcrete is ideal for pouring floors on buildings several stories high. As one floor is completed, the pipe line is just extended on the job. Expensive preparatory tower work, buggies and buggy runs and costly moving of such equipment are eliminated.**

***Ask your local Rex Distributor to give you the "cutting details" of concrete by pipe line. Or, if you prefer, write to Chain Belt Company, 1633 W. Bruce Street, Milwaukee 4, Wis.***

CHAIN BELT
REX
COMPANY

CONSTRUCTION MACHINERY . . .

® PUMPCRETE IS THE REGISTERED TRADE-MARK OF CHAIN BELT COMPANY

# GUTS

When two-legged people have guts, they finish the fight and do the job.

Real guts—that's what the world admires—man or machine.

You can't define what makes guts in a man, but you can "analyze" the fighting, working, dogged innards of the Champ. So let's put the X-ray on the TD-24:

**Drawbar Horsepower:** 148 working horsepower delivered at the drawbar in official tests.

**Synchromesh Transmission:** you "shift on-the-go," with eight speeds forward, eight reverse for faster time cycles with more pay dirt per cycle.

**Instant Speed Change:** up or down one speed without declutching.

**Planet Power Steering:** all turns are easier . . . pivot turns, feathered turns, turns with power on both tracks.

**Reserve Torque:** gives the Champ the lugging ability to fight through temporary overloads.

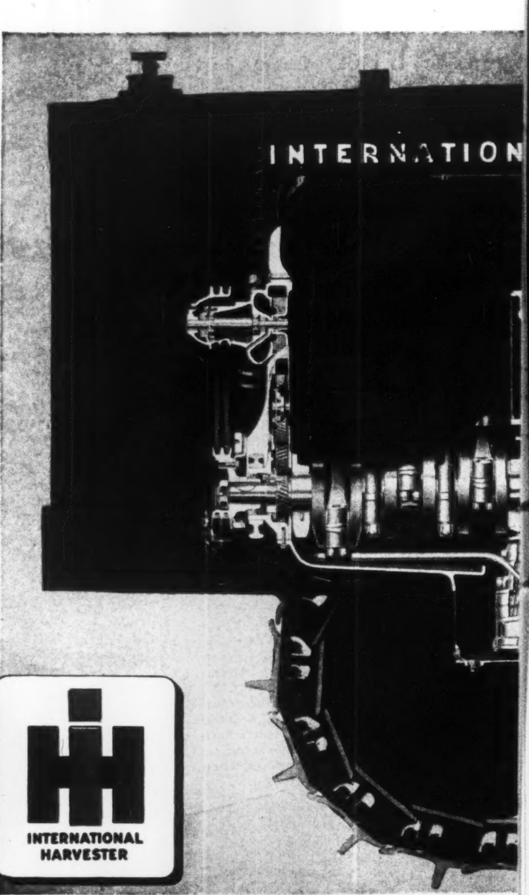
**Easy Steering:** finger-tip hydraulic controls.

**All-Weather Starting:** push-button, gasoline-conversion starting —an International exclusive—gets you on the job fast.

**More Work:** the TD-24 is doing more work—with more speed and more lugging ability—than any other crawler tractor on the market.

Look it over. Then ask your International Industrial Distributor to show you what it can do for you. You'll be a TD-24 man from then on in.

**INTERNATIONAL HARVESTER COMPANY**
**CHICAGO 1, ILLINOIS**



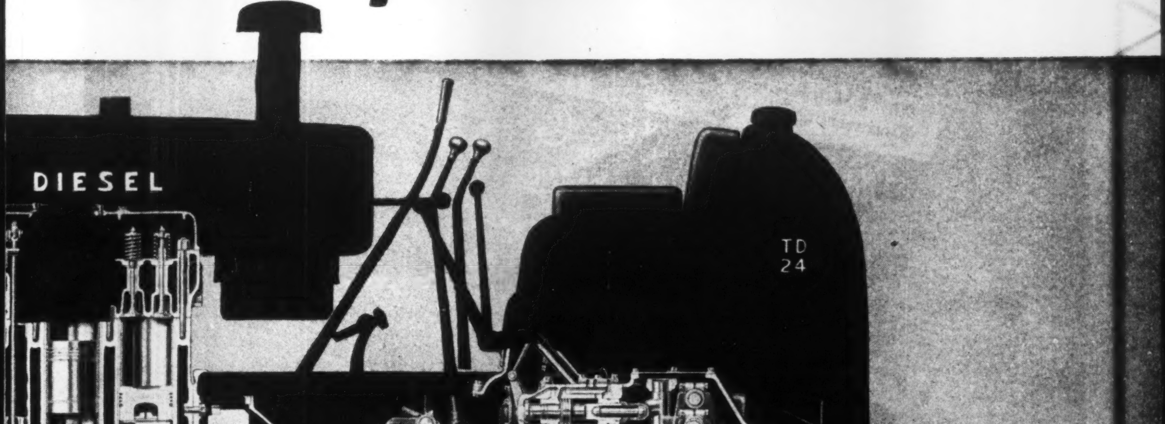
**POWER THAT PAYS**

**INTERNATIONAL**

**INTERNATIONAL HARVESTER**

# OF A CHAMP

## inside story of the TD 24


DIESEL
TD 24

SPEEDSHOVEL
Speedcrane

# naturally it's a MANITOWOC

Where ever there's a tough rock job you're bound to find a Manitowoc. With men who know equipment best, with men who've tried 'em all . . . it's Manitowoc by a wide margin.

A Manitowoc is built to take it — big, hefty construction throughout . . . simplicity of design that puts more engine power at the dipper . . . rugged design that assures continuous, day after day operation. You'll be yards ahead with a Manitowoc on *any* job. Manitowoc Engineering Works, Manitowoc, Wis.

**MANITOWOC**

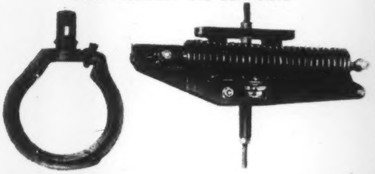
**Speedcrane**

SHOVELS
1-5 YD.

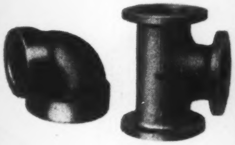
CRANES
18-100 TON

# EVERYTHING FOR PIPING

**PIPE HANGERS and SUPPORTS**



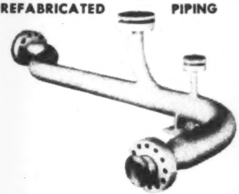
**CAST IRON FITTINGS**



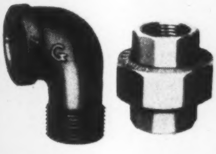
**WELDING FITTINGS**

6"SCH 80
GRINNELL
XT WALL

**PREFABRICATED PIPING**

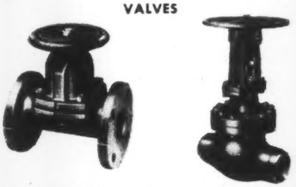


**MALLEABLE IRON FITTINGS**



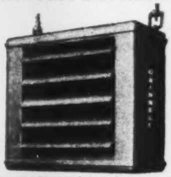
**FORGED STEEL FLANGES**

**VALVES**

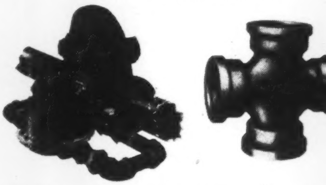


**STEEL NIPPLES**

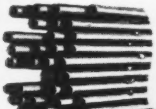
**THERMOLIER UNIT HEATERS**



**WATER WORKS SPECIALTIES**



**PIPE**



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at your nearby
**GRINNELL**
Warehouse or
Jobber

Whatever your requirements for pipe, fittings, valves and other standard piping materials, you can get prompt delivery from a Grinnell warehouse or jobber. When the job calls for specialized piping products or installations, Grinnell has the manufacturing facilities, products, experience and engineering knowledge to "deliver the goods".

# GRINNELL

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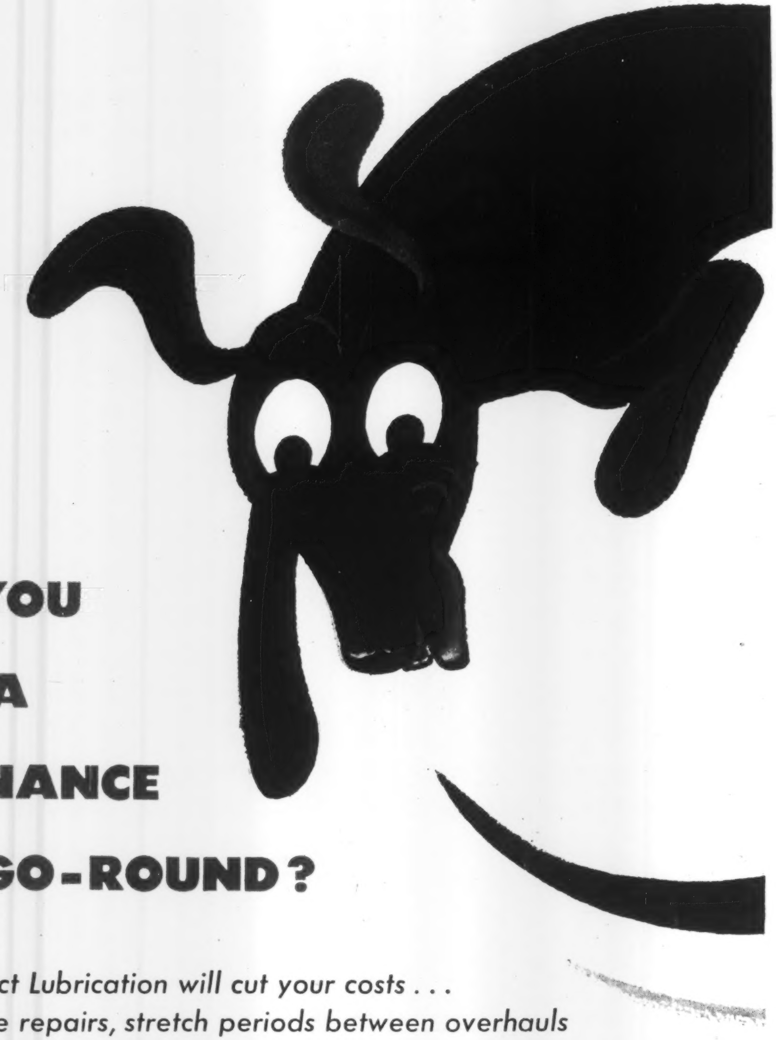

# ARE YOU ON A MAINTENANCE MERRY-GO-ROUND?

## *Correct Lubrication will cut your costs . . . reduce repairs, stretch periods between overhauls*

Are your units in the shop more than you'd like them to be? If so, better check your lubrication set-up to help cut downtime. For lubrication is far more than just "oil and grease." It's knowledge of your machines and their exact lubrication requirements. It's use of the *right* lubricants—and knowing how to use them most effectively.

You get both specialized knowledge and top-quality products with Socony-Vacuum *Correct Lubrication.* It's a complete, carefully planned program of lubrication—tailor-made for your particular equipment and operating conditions. That's why it helps increase efficiency, reduce repairs and overhauls, cut maintenance and lubrication costs.

For all the benefits of *Correct Lubrication*, call in your Socony-Vacuum Representative.

SOCONY-VACUUM

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Socony-Vacuum gives you . . .

- Help on maintenance problems.
- Individual, tested lubrication schedules.
- Advice on correct application of lubricants, proper handling and storing.
- One source of supply—available everywhere.
- Simplified inventory—with . . .

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2. **MOBILUBE GX**—for all enclosed gears—manually operated transmissions, rear axles and final drives.
3. **MOBILGREASE**—in grades and types for proper lubrication of all chassis parts and engine accessories.

# CORRECT LUBRICATION

# *for Contractors*

**THE FLYING RED HORSE COMPANIES: SOCONY-VACUUM OIL COMPANY, INC.**
**MAGNOLIA PETROLEUM COMPANY • GENERAL PETROLEUM CORPORATION**

# Split Half a Second into Sixteen Parts . . . *and you get a sensational improvement in blasting methods!*

Here's a picture that shows WHY the ROCKMASTER Blasting System pays off! Notice the rock in motion. And yet the explosive gases are held within the burden. No spectacular "spouts" of gas going to waste. Result: Greater explosives efficiency, better fragmentation, less vibration, greater safety.

In a ROCKMASTER blast, holes are electrically fired at controlled split-second intervals. The timing is in each electric blasting cap. The ROCKMASTER "16" series offers you a choice of sixteen milli-second delay detonators, all starting together, all firing at timed intervals in a little over half a second!

### *For rock, coal, ore—on the surface or underground*

Your job may call for two, three or all sixteen ROCKMASTER detonators. We help you select them to fit your job. Drill pattern and explosives are based on what you want to accomplish. Many times, this means important savings in drilling and dynamite.

Write for your copy of the booklet on the ROCKMASTER "16" Blasting System. It includes diagrams for loading in quarrying, stripping, mining, construction.

*Less Bark*
*More Bite*

**ROCKMASTER "16" TIMINGS**

| Rockmaster No. | Avg. Time of Each Delay from Zero (milli-seconds) |
|---|---|
| 0 (zero) | 0 (inst.) |
| 1 | 8 |
| 2 | 25 |
| 3 | 50 |
| 4 | 75 |
| 5 | 100 |
| 6 | 125 |
| 7 | 150 |
| 8 | 175 |
| 9 | 200 |
| 10 | 250 |
| 11 | 300 |
| 12 | 350 |
| 13 | 400 |
| 14 | 450 |
| 15 | 500 |
| 16 | 550 |

ROCKMASTER: Reg. U. S. Pat. Off.

**ATLAS** EXPLOSIVES

*"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

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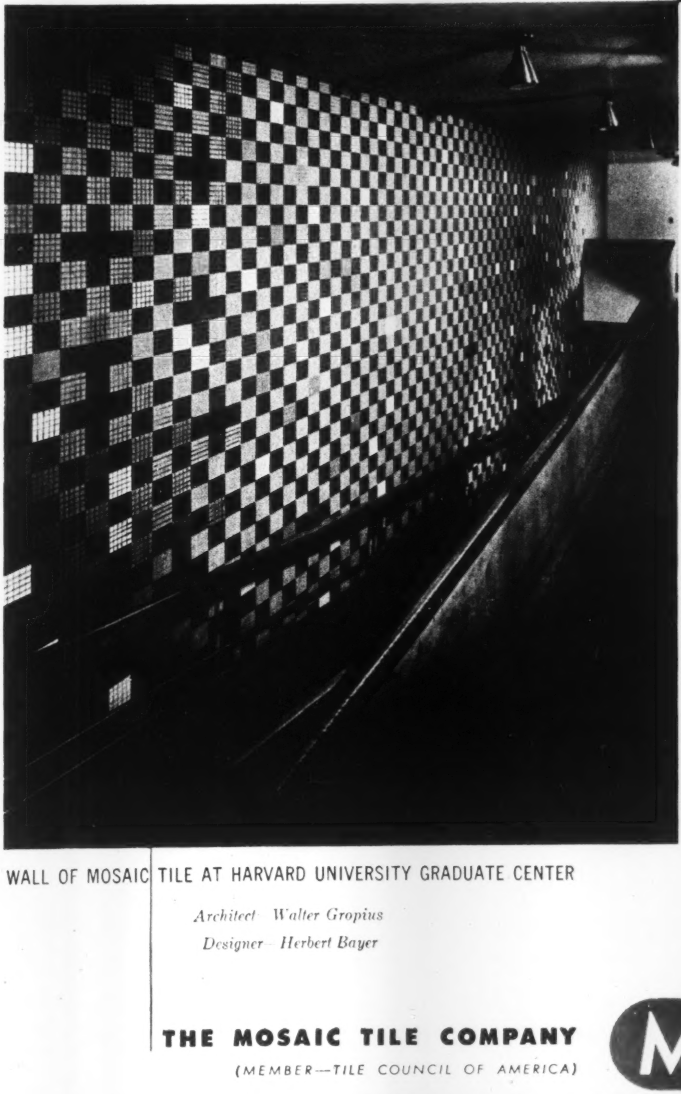
# DESIGN

*and what to do about it.....*

*to create*
*a modern*
*impression*



WALL OF MOSAIC TILE AT HARVARD UNIVERSITY GRADUATE CENTER

*Architect—Walter Gropius*
*Designer—Herbert Bayer*

Architect Gropius has given tremendous impetus to the expanded use of an age-old material in modern, functional design with his ceramic Mosaic Tile wall in Harvard University's new Graduate Center.

This abstract design is an outstanding example of the beauty, utility and permanence which Mosaic Tile provides for both horizontal and vertical surfaces.

You get a rare combination of values when you use Mosaic Tile. You get complete freedom for your design ideas. You get wear unequalled by other materials. You get an extensive color range from which to choose. And you get important cost reducing advantages as Mosaic Tile cannot burn or fade and its maintenance cost on floor or wall is negligible.

For intelligent, long-life remodeling or for new construction, we'll welcome the opportunity to execute your design plans in Mosaic Tile or to create design ideas for your approval. In the meantime, write for Mosaic's new Ceramic Floor Tile booklet—you'll find it extremely valuable. Address your request to Dept. 26-2, The Mosaic Tile Company, Zanesville, Ohio.

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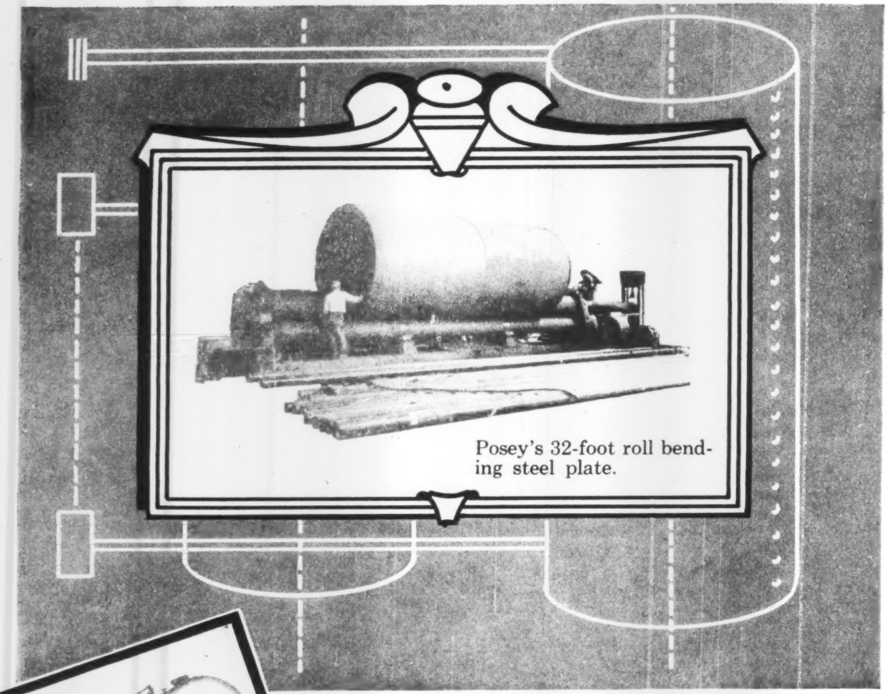

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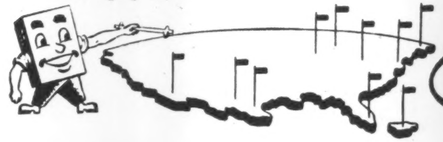

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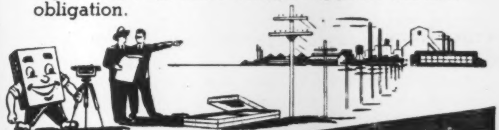

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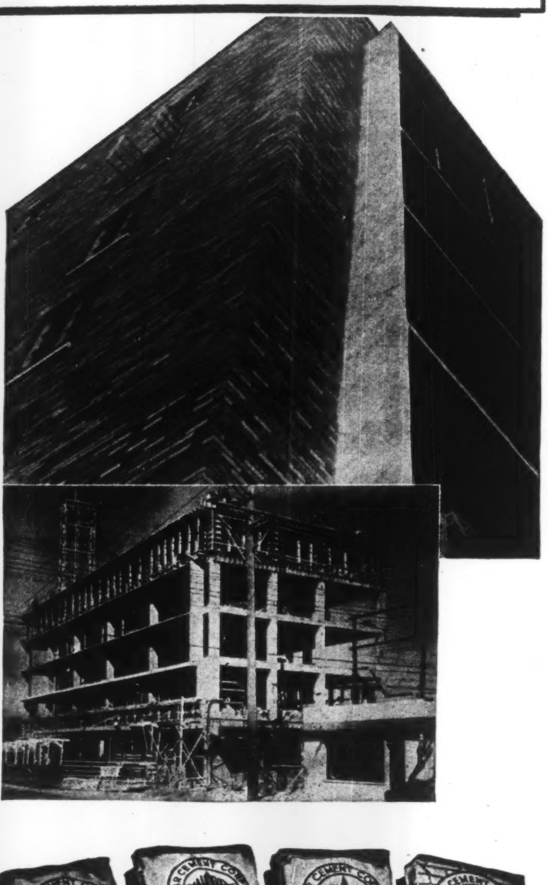

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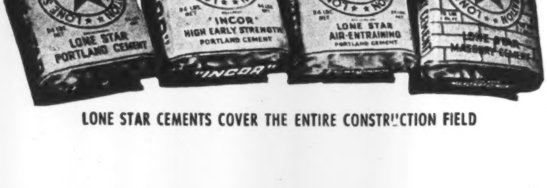
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# THE CONSTRUCTION WEEK

**BREATHING SPELL**—NPA's Construction Controls Division wants a 60-90-day armistice on amendments to M-4. "Stop tampering with the order for awhile," say officials in this division, "Give builders a chance to learn what it means." If that thinking sticks, last week's minor amendment—the fourth since the commercial freeze Jan. 13—completes the alterations for a couple of months.

**DO'S FOR BUILDINGS**—If you have a hospital, school or other structure that can't be completed because some component is unobtainable, you may be able to get priorities assistance on the particular item needed. Apply to the Building Materials Division, National Production Authority, Washington 25, D. C.

**MORE OFFICES FOR APPLICATIONS**—NPA has empowered 11 additional Commerce Dept. field offices to act on applications for commercial building. They are located in El Paso, Hartford, Houston, Jacksonville, Memphis, Miami, New Orleans, Pittsburgh, Providence, Salt Lake City and San Antonio. This brings to 29 the number of field offices that can act on applications involving no more than $1 million or 50 tons of steel (ENR Feb. 22, p. 23). Information and application forms can be had in Commerce offices in more than 80 cities. But the completed form must be submitted to one of the 29 offices empowered to act.

**HOUSING CREDIT**—Federal Reserve Board changes in Regulation X last week were designed principally to save a few non-residential builders from substantial losses. The two amendments—minor in nature—portend no softening of credit terms for housing. On the contrary, the board thinks the credit curbs are not a bit tougher than they ought to be.

**SHELTER GIMMICK**—NPA is beginning to get applications for commercial buildings specially designed to include public shelter areas. The shelter feature adds nothing to a building's chances for NPA approval. Decisions still are based on two criteria: Is the building necessary, and does it require critical materials?

**A-BOMB EFFECTS**—Current tests of atomic weapons at Eniwetok include measurement of effects—blast, heat and radiation—on structures and materials of various kinds. The Atomic Energy Commission is carrying out a major project for that purpose, well instrumented to obtain data for developing design criteria. The information will be used by the Civil Defense Administration.

**AIR, LAND AND SEA TRANSPORT UNDER ONE BOSS**—Delos W. Rentzel, former chairman of the Civil Aeronautics Board, was appointed Commerce under-secretary for transportation succeeding Gen. Fleming (see p. 73) and also became the key director of the newly-created Committee on Defense Transportation and Storage. His jurisdiction includes Knudson's Defense Transport Administration.

**WANTS RESTRICTIONS EASED**—James K. Knudson, Defense Transport Administrator, in a letter to each of the governors of the 48 states, stated that all motor carrier traffic has to be considered essential during the present emergency. He bore down against "unjustifiable state limitations on sizes and weights of motor vehicles. . . ." Knudson wants free movement of defense transportation among the states. This would include full utilization of interstate highways and secondary roads and relaxation of spring thaw restrictions.

(*Continued on page 69*)

# How to Get Steel for *Maintenance and Repairs*

## *use NPA Regulation No. 4*

Any business—large or small—may now use a DO rating to obtain limited quantities of steel for maintenance, repairs and minor capital additions. The rating to apply is DO-97 as authorized by the NPA's new Regulation No. 4.

Obviously the use of this rating does not automatically get the steel because it is impossible to maintain complete stocks under present conditions. However, it does assure your order of preference over unrated orders and equal treatment with all other orders bearing a priority rating. If we have the steel you get it. Moreover, we can in turn extend the rating which should help us to maintain stocks for your future needs.

So remember, if your order falls within the provisions of Regulation No. 4 take advantage of it—use your rating! You can be sure that we will make every effort to take care of you as promptly and fully as possible.

*If you do not have this Regulation No. 4 we will be glad to send you a copy.*

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(*Continued from page* 67)

**TWO-SIDED PUBLICITY CONFUSES**—J. R. Law, Chairman, Wisconsin State Highway Commission, points up the need for more thorough publicity campaigns by good roads organizations. He says the motorist is confused by two sets of arguments. Petroleum industries, the American Automobile Association and the National Highway Users Conference tell him he is paying excessive fuel taxes. State and federal highway departments command less fanfare, he said, but if the highway user takes time to read their publicity at all, he learns that U. S. roads are deteriorating faster than they can be maintained and improved.

**BRIDGE PREFERRED**—The Delaware River Joint Commission voted to build a bridge across the river between Philadelphia and Camden, N. J., to the south of the present Delaware River Bridge. Plans were announced recently for a six-lane span, 11,251 ft long, estimated to cost $69.4 million. The alternate, a vehicular tunnel, would cost $93 million.

**THREE RIVERS CARRIES ON**—No announcement has yet been made regarding the investigation of the Three Rivers bridge disaster (ENR Feb. 8, p. 23) beyond the statement by Quebec's Premier Duplessis that a commission of inquiry would be appointed. A railroad "jitney" service and river ferries shuttle traffic between Three Rivers and Cap de la Madeleine. Principal emergency operation is the feverish construction of two Bailey Bridges to connect St. Christopher's Island with the two shores, utilizing old piers so far as possible.

**100% TURNOVER**—A new five-man State Licensing Board for General Contractors has been named by Gov. Gordon Persons of Alabama. The new board succeeds a former one which was let go recently when the members objected to the governor's order that all state agencies be placed under a budget. The new board includes Otis Coston of Bessemer, chairman; Wayne Palmer, Mobile, vice-chairman; Reese Phifer, Tuscaloosa, secretary-treasurer; and M. D. Saxon and G. T. Key, both of Montgomery.

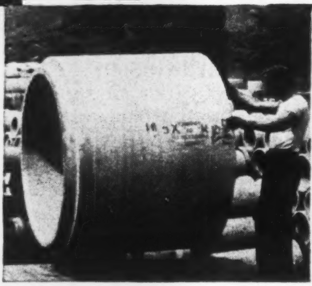
**HYDROELECTRIC PLAN FOR NEW ENGLAND**—The Connecticut River Power Co. has filed an application with the Federal Power Commission to construct a $45-million hydroelectric development on the Connecticut River at Littleton, N. H., and Waterford, Vt. Plans include a combination earth and concrete dam over a mile long, with a maximum height of 150 ft—creating a lake 11 miles long to store 115,000 acre-feet of water.

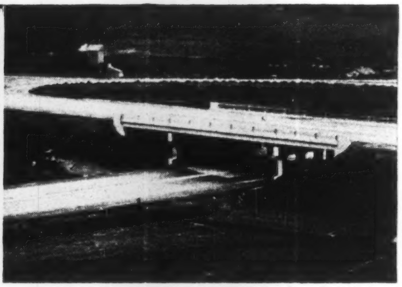
**FISH OR POWER?**—A recent Natural Resources Conference report for British Columbia showed that the value of all species of salmon caught in B. C. during 1948 was $19.9 million. The estimated 10 million electric hp potential of the rivers of the province would be worth between $150 and $200 million a year. Fisheries and power men agreed to cooperate.

**STATE-FOSTERED HARBOR IMPROVEMENT**—Congressman Edward T. Miller, from the Eastern Shore area, proposes that Maryland establish a State Waterways Commission to improve and maintain harbors and channels throughout the state. His proposal stems from curtailment of such projects by the government. To serve the seafood industry, small boat operators and the public generally, it is suggested that most of the commission's projects could be financed by a boat-fuel tax.

# BETTER CONCRETE

## made with Atlas Duraplastic*





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**BETTER CONCRETE** results because Duraplastic air-entraining portland cement concrete is more workable, more cohesive, more uniform. In structural work this increased plasticity aids proper placement, improves surface appearance. On paving jobs it means easy spreading and screeding; permits finishing to start closer to the paver and allows earlier protection for curing. More and more products plants use Duraplastic to improve their products.

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ENR D-121

ENGINEERING NEWS-RECORD

MARCH 29, 1951 VOL. 146 NO. 13

# Defense projects receive prompt NPA priority help

### Industrial Expansion Division is understaffed but is expediting projects important to defense production—Contractors and owners must supply complete data

Industrial projects important to defense production are getting priorities help from the National Production Authority. An understaffed Industrial Expansion Division is doing its best to arrange DO ratings for critical materials and equipment needed to complete the plants and get them into operation.

Most urgent on the division's list of applicants are partially completed plants held up by lack of steel or other items. Second are new projects that are feeling their first pinch of materials shortages. These builders are asked to list what materials they need now and what they will need later, specifying quantities and delivery dates.

With seven engineers and a typist, William E. O'Brien, director of the division, is trying to do a job that calls for ten times the staff.

Frank R. Creedon, NPA assistant administrator in charge of the Facilities and Construction Bureau, brought O'Brien to Washington from the Brookhaven Laboratories of the Atomic Energy Commission on Long Island. There O'Brien had run the job as engineering coordinator and construction manager for the AEC contractor, Associated Universities.

• **Information please**—In the rush of getting things started, the industrial expansion division has had no time to draw up application forms. But it has laid out a clear list of information it wants from industrial companies and contractors who come to it.

If the project meets the test of essentiality, O'Brien's engineers get in touch with the NPA materials or end-product divisions concerned. Steel and copper are two divisions called frequently. Each division is asked to OK the DO ratings for its particular products.

Once a materials division understands the purpose of the request, approval is given promptly in nearly all cases. But—because the industrial expansion staff has had no time to get out general information to NPA personnel—some explaining is necessary when a request goes to a division that is not familiar with the operation.

• **Clearance by committee**—After getting approval on the priorities needed, O'Brien's office submits the project application to the NPA Facilities Clearance Committee, made up of Manly Fleischmann, Adiminstrator, Creedon, and Glen Ireland, another assistant administrator, for final OK.

Clearance by this committee validates the priorities for immediate needs of the project. It also facilitates later assignment of additional DO ratings called for by the construction schedule.

This schedule is one of the items that the industrial expansion division asks an industrial applicant to supply. With it, the contractor on the job lists the material and equipment on which priority assistance is required. The contractor gives full information on items, quantities, dates when deliveries are needed, purchase order numbers, dollar value, and statements from suppliers stating why the orders cannot be filled.

• **All essential data required**—Other information is required from the owner of the project: The product to be made, capacity of the plant, production contracts from the U. S. Government or its prime contractors, relation to defense needs or public health and safety, certificate of necessity—for tax amortization—granted or requested, government sponsoring agency (if any) and present status of the job. Along with these data, the owner furnishes a general layout of the project, descriptions of the structures, with plans or sketches, total estimated cost, and a statement as to whether the construction is for a new, independent plant or for expansion or alteration of an existing facility.

# N.Y. building slows with restrictions

Sharply criticizing "inconsistent, impractical and unrealistic" restrictions on the uses of building materials, the New York Building Congress last week called for immediate revision of existing regulations lest they stop construction in the city altogether.

These restrictions have already brought on unemployment in the building trades, and threaten a complete construction stoppage in six to eight months, according to a report submitted to the builders by their Construction Controls Committee.

Citing inconsistencies, the committee report said that one government directive permits certain types of nondefense construction, another nullifies the provision by preventing the use of materials already available; "we find," said the report, "that National Production Authority has not provided in its programs for construction in large metropolitan areas like New York, which cannot expect to have any significant volume of defense production."

• **Special case**—The report called attention to the special circumstances in New York, where the construction industry involves the livelihood of an estimated 275,000 workers and their families.

In the city, builders said, when current projects (started before restrictions) are completed, non-defense building will come close to a standstill, and defense work won't take up the slack.

"As a consequence, there will follow a serious dislocation in the industry and widespread unemployment—this (city's) skilled labor force cannot be shifted readily to other areas or into other industries, and be utilized easily."

Peter W. Eller, chairman of the Board of Governors of the city's Building Trades Employers Assn., and a member of the committee, added that about 8,000 building tradesmen are out of work now, and said that there might be 20,000 unemployed within another month.

• **Not much needed**—The report emphasized that relatively small amounts of "strategic" materials are needed for the average multi-storied building in New York. "Materials listed as strategic or in short supply represent less than 2% of all materials (so) required," the report adds.

## I.J.C. hears testimony on $270,000,000 project

The International Joint Commission has heard 18 witnesses testify in favor of a proposed $270,000,000 power and flood control project on the Kootenai River. Location of the proposed project would be Libby, Mont.

Approval of the International Commission is needed since the dam would flood 17,700 acres of Canadian territory, as well as 33,800 acres in the United States.

Brig. Gen. O. E. Walsh, North Pacific division engineer for the Corps of Engineers testified that the Kootenai is a real trouble-maker, and that the dam proposed for Libby would increase Pacific Northwest power output by 30%, or 6,400,000 kilowatts of electrical output annually.

The commission has three Canadian and three U. S. members.

# Bi-state industries ask deeper channel

More than 300 industrial leaders and local government officials met recently in Trenton, N. J., to urge the dredging of a 40-ft channel in the Delaware River between Philadelphia and Trenton. The meeting was called by the U. S. Army Engineers.

Ross L. Leffler, assistant to the executive vice-president of the United States Steel Co., said that his company would ship between 7 and 13 million tons of coal and Venezuelan iron ore by water to its forthcoming Fairless Works at Morrisville, Pa.—if the channel was deepened to accommodate ocean-going vessels with a 35-ft draft.

Mayor Donal J. Connolly of Trenton said industrial firms in adjacent New Jersey areas would ship annually more than 2 million tons via the river if the channel were dredged. He presented the Engineers with signed estimates of tonnage from more than 100 companies.

The Delaware between Philadelphia and Trenton now has an authorized channel depth of 25 ft. However, the channel was permitted to fill during the war, when dredging operations were suspended.

Its authorized depth has not been restored and the actual depth at present is less than 12 ft.

Industrialists estimate that proper river facilities would save upwards of $10 million a year in shipping costs.

Albert M. Greenfield, Philadelphia Chamber of Commerce president, stated that delay on the part of the government in deepening the channel would hold up construction of a new industrial empire along the Delaware Valley between the two cities.

It was pointed out also that a 40-ft channel would give the U. S. another deepwater port on the east coast. This would be an added national defense dividend in the event that the harbors of New York and Philadelphia were bombed.

## HHFA plans ways to save on building materials

A five-point program has been developed by the Housing and Home Finance Agency in an effort to help spread housing materials as far as possible under the defense program.

First HHFA plans a study of housing construction to help cut down materials used, and save on manpower and transportation.

Second, it plans to develop new materials-saving methods such that housing quality will not be cut down.

Third, HHFA plans to set up construction standards limiting the use of scarce materials and manpower without dropping below acceptable minima.

Fourth, it plans for the distribution of all this information once it has been obtained, to encourage the use of the standards and methods arrived at through the three studies.

Fifth, to help builders adapt themselves to changing conditions, building codes, labor practices, lender attitudes and policies.

HHFA expects to carry out its program in cooperation with mobilization agencies, industry, labor organizations and local building officials.

Theodore T. Knappen

## T. T. Knappen dies; headed engineering firm

Theodore Temple Knappen, 50, internationally known civil and hydraulic engineer and senior partner of Knappen, Tippetts Abbett Engineering Co. of New York City, died March 20 after a brief illness.

A native of Minneapolis, Minn., Mr. Knappen was a graduate of the U. S. Military Academy at West Point (1920) and received his civil engineering degree from Renssalaer Polytechnic Institute (1922). He served as an officer in the Corps of Engineers from 1920 to 1923. He rejoined the Corps in a civilian capacity from 1928 to 1934, when he was area engineer on Mississippi River flood control work and for the Memphis engineer district. Again, between 1936 and 1937, he acted as consultant and chief of the flood control section for the North Atlantic Division of the Corps.

Between 1923 and 1928 he was engaged with private engineering concerns and with municipalities on various hydro-electric, irrigation and water supply developments (including the Hetch-Hetchy project for San Francisco); and in 1934 he became chief of the engineering section for the Muskingum flood control project in Ohio.

In 1937, Mr. Knappen joined the staff of the New York consulting firm of Parsons, Klapp, Brinckerhoff and Douglas, to organize and manage its South American affairs.

He left this firm in 1942 to form his own consulting organization—which now handles engineering work throughout the U. S. and in many foreign countries—including Palestine, Turkey, Brazil and India.

## Riprap substitute tested in the Great Plains area

March 15 saw work on a test section of the Bonny Reservoir, eastern Colorado, begin to replace expensive, imported riprap with asphaltic concrete and soil-cement.

Northwestern Engineering Co. of Denver has the $82,890 contract for the job of building a 400-ft long earth-filled embankment 24 ft high for the full-scale testing operations.

Substitute materials are being tested because of the high transportation cost of bringing the rock riprap to dam projects in the Great Plains area which lacks suitable rock supplies. Riprap for some 15 dams in the lower Platte River area might cost some $55,000,000 due largely to hauling charges.

Test sections are located about two-thirds of mile upstream from Bonny Dam.

## BIDS AND BIDDERS

**Ford Motor Plants**—Ford Motor Company, Dearborn, Mich. awarded $17,000,000 construction contracts on its proposed $60,000,000 aircraft engine rehabilitation plant at Chicago. Main Building was let to Ragnar Benson, Inc., Chicago; machinery foundations to Darin & Armstrong, Detroit, Mich.; foundry to Sherman Olson Co., Chicago, and forge plant to W. E. O'Neil Construction Co., Chicago. Albert Kahn & Associated Architects and Engineers, Inc., Detroit, is engineer-architect. The company also announced award for design and construction of service parts warehouse at Teterboro, to Austin Company, Cleveland, O. at an estimated cost of $4,000,000.

**Steel Plant**—Sheffield Steel Corp., Houston, Tex. is taking bids from selected list of bidders for the construction of a $75,000,000 steel plant at Houston, Tex. W. C. Higdon, is engineer for owner.

**Quartermaster Research Depot**—The Ballinger Company, Philadelphia, Pa., has been selected as consulting engineer by the Quartermaster Department, South Boston, Mass., for the $15,000,000 Quartermaster Research Laboratory, at Natick, Mass.

**Housing**—Winn-Senter-Rau Construction Co., Kansas City, Kan., will construct by own forces a $10,000,000 housing development, including business center and utilities at Bel Crest, near Kansas City, Kan.

**Silicon Alloys Plant**—Vanadium Corporation of America, New York, N. Y., will construct a silicon alloys plant at New Haven, W. Va. by separate contracts. Estimated cost is $7,000,000. Giffels & Vallet, Detroit, Mich., are consulting engineers.

**Refinery**—Gulf Oil Corp., Port Arthur, Tex., plans a refinery plant at Port Arthur to cost about $18,000,000.

**Power Plant and Line Improvements**—Columbus & Southern Ohio Electric Co., Columbus, O., plans to install two 60,000 kilowatt generating units in E. M. Poston Power Station near Athens, O., at about $26,500,000. The company will also expand transmission system, at a cost of $14,500,000 and improve distribution system at $11,500,000. All work is scheduled for completion in 1953.

## Specs written for high-tensile bolts

Approval of a specification for making structural connections with high-tensile steel bolts may bring a considerable increase in this type of construction. (With these bolts, joints hold by friction, not by shear in the bolts or bearing.) Though the bolts are reported to cost more than plain rivets, savings in the cost of installation generally should more than make up the difference.

High-tensile bolts have been shown to be particularly advantageous for structures subjected to many repetitions of cyclic loading and have been found a satisfactory substitute for rivets that failed or loosened in service in railroad bridges. Several hospitals are now being built for which the contractors chose high-tensile bolts.

As approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation, the specification provides that these bolts may be substituted unit-for-unit, and at the same allowable shear stress for structural steel rivets of the same diameter, to resist the shear at faying surfaces of any structural steel joint.

The bolts may be used with the customary $\frac{1}{16}$-in. clearance associated with ordinary riveted work and with unfinished bolts. They must have a minimum yield point ranging from 74 to 90 kips per sq in. and a tensile strength ranging from 105 to 125 kips per sq in., depending on the bolt diameter. At least one carburized or quenched-and-tempered washer should be under each nut and bolt head.

All nuts should be tightened to produce a bolt tension of at least 90% of the elastic proof load of the bolt. Finally, between 5 and 10% of the bolts should be checked for tension by loosening and tightening. Several means may be employed for applying the tension—manual plain wrenches, manual torque and power wrenches.

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## Fleming nominated to Costa Rica post

President Truman has nominated Maj. Gen. Philip B. Fleming Ambassador to Costa Rica to fill the vacancy there caused by the assignment of Joseph Flack to the ambassadorship to Poland.

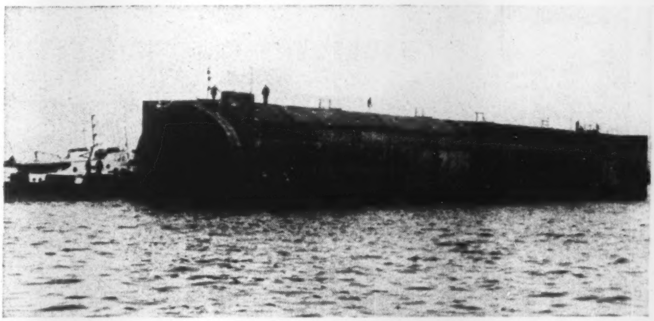
The appointment was anticipated (ENR March 8, p. 17).

Gen. Fleming has been chairman of the Maritime Commission from June of 1949 through July of last year when, under a reorganization of that department its functions were transferred to a board in the Department of Commerce. Since then he has been Undersecretary of Transportation.

Gen. Fleming is a graduate of the U. S. Military Academy and has been a professional soldier in the Corps of Engineers, retiring in January 1947.

The years 1933-1935 found him serving as Executive Officer and Deputy Administrator of the Public Works Administration. In 1935 and 1936 he was in charge of Passamaquoddy, and in 1936 and 1937 coordinator, Resettlement Program.

General Fleming became Federal Works Administrator in 1941, the job he held until his appointment to the Maritime Commission. On May 7, 1946 President Truman gave the General the Distinguished Service Medal in recognition of his public service.



**TUNNEL SECTION AFLOAT—This 300-ft section of a 35-ft dia trench-type vehicular tunnel was sunk into position under the Elizabeth River, Norfolk, Va., last week. Section was built at Bethlehem-Sparrows Point Shipyard, Baltimore, and floated to Norfolk. Here it received an inner "ring" of concrete 18 in. thick and a 22-ft roadway slab for two lanes of traffic. Seven such sections will form the underwater portion of the Elizabeth River Tunnel linking Norfolk and Portsmouth. Merritt-Chapman & Scott Corp. is the contractor.**

# Central Valley nets $29.9 million

Since beginning operations in 1944, California's Central Valley Project (ENR June 12, 1947, p. 945) has had a net income of $29,939,000 from sales of power and water, according to CVP's annual report issued this month.

By the end of 1950, federal investment in the project amounted to $340,000,000 and it is estimated that future construction will cost $622,800,000.

Gross operating income from power sales (largely to Pacific Gas & Electric Co.) totaled $34,909,000, while revenue from irrigation water amounted to $2,196,000. Water sales for municipal and industrial use brought in $784,000, the report stated.

Deductions for operation and maintenance totaled $7,950,000. Power operating and maintenance expenses were $3,523,000, irrigation, $2,239,000, and municipal and industrial $639,000; provision for replacement amounted to $1,547,000.

Almost 90% of the total cost of the project will be repaid to the federal government by revenues resulting from sales of power and water. The report states that power revenues eventually will pay for about 45% of the project. Income from sale of irrigation, municipal and industrial water, will pay for about 42%. The remaining 13% of the project cost involves features incorporated for flood control, navigation, fish and wildlife protection, salinity repulsion and recreational use. These are to be charged as nonreimbursable items.

Increased revenues from the sale of irrigation water are expected this year when three of the canals and the Tracy pumping plant are put into operation.

So far, 304,928 acres are receiving irrigation water from CVP. Eventually, the total will be 1,247,000 acres.

Hydroelectric power capacity at the end of last year amounted to 450,000 kw from the Shasta and Keswick power plants. Plans call for an addition of 167,000 kw capacity by 1955.

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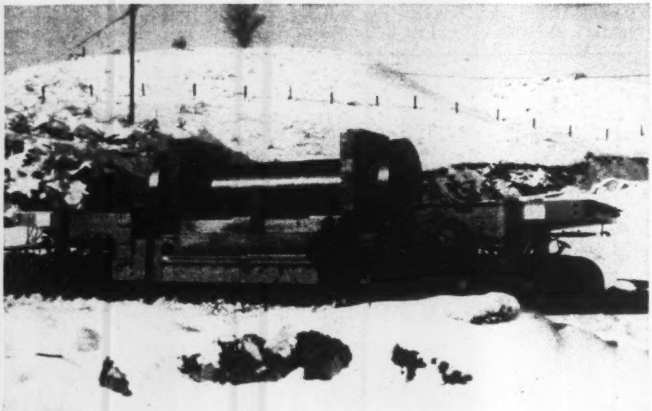
## Quebec hydro scheme plans 35-ft dia diversion tunnel

A 300,000-hp hydro development is to be built for Quebec North Shore Paper Co. on the Manicongan River where it empties a flashy flow into the St. Lawrence estuary. Two 50,000-kw units are to be installed immediately to utilize a 120-ft net head available.

Major item in the first stage of construction will be a 35-ft dia diversion tunnel 1,700 ft long to carry the Manicongan past the construction site. Economics of this large diameter bore were justified by its obviating the need for extensive costly cofferdamming of the dam construction. Unwatering of the site was a major consideration since the river's flow varies widely, from 10,000 to 200,000 cfs.

General contractor for the job is Angus Robertson, Ltd., of Montreal; no cost figures have been revealed, as yet, but estimated cost is $14,000,000. H. G. Acres & Company, Niagara Falls, Canada are consulting engineers.



**WEIGHTY MATTER—Bureau of Reclamation uses this 100-ton capacity, two-way trailer to haul heavy equipment to Grand Coulee Dam on the Columbia River. Here a 51-ton generator shaft is on its way to a powerhouse. Trailer is 53 ft long and has steering mechanisms at each end, requires only an 18-ft turning radius. It was built by Pacific Coast Engineering Co., San Francisco; cost $33,500.**

## OBITUARY

**Clarence M. Cole**, 68, retired civil engineer of Seattle, Wash., died there March 4. A graduate of the University of Washington, he had been with the Stone & Webster Engineering Corp. and the Bureau of Reclamation before his retirement in 1940.

**John A. Earley**, 65, civil engineer and port commissioner of Seattle, Wash., died there March 4. He learned his engineering through practical experience and a correspondence course before obtaining his license. After working for the Bureau of Reclamation, several railroads and the Washington state highway department, he entered the King County engineering office in 1914. In recent years, he was chairman of the Port of Seattle Commission and consulting engineer for a river control project in King and Pierce counties.

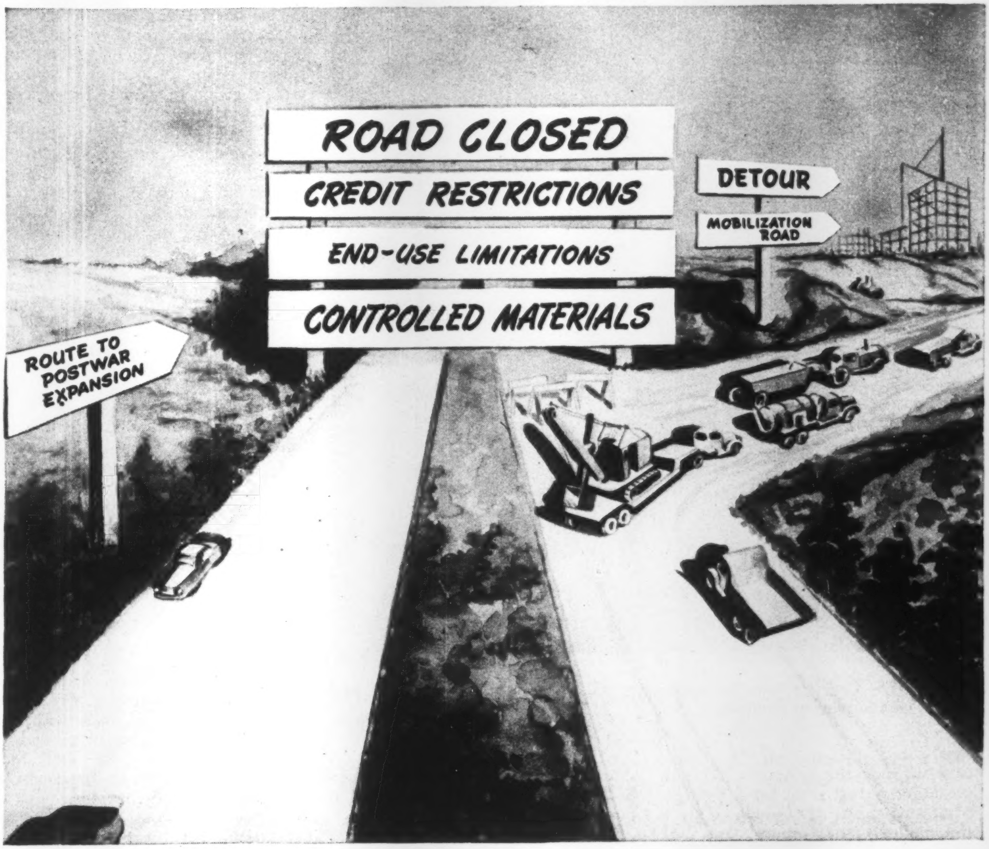
**Hugh J. Linthicum**, 65, for 42 years an engineer at the Washington Terminal Co., died March 4 in Washington, D. C. Mr. Linthicum worked in Washington for the Pennsylvania Railroad Co. and when the Washington Terminal Co. was founded he became one of its first engineers.

**John C. Remington, Jr.**, 66, for the last five years engineer for Ocean County, N. J., died March 7 at Lakewood, N. J. He had been a member of the New Jersey Board of Professional Engineers and Land Surveyors since its organization. He had served as engineer for several municipalities in New Jersey, New York and Pennsylvania.

**Harry O. Parker**, 78, retired district engineer for the Massachusetts State Highway Department, died in North Adams, March 6. He supervised much of the highway construction in Norfolk and Bristol Counties.

**Thomas B. Mayes**, 59, engineer with the United States Army Engineers, died March 2 in Washington, D. C. He went to Washington in 1923 to help on construction of Memorial Bridge. He worked for the Army Engineers between 1935 and 1948, when he retired.

**William Floyd Burriss**, 54, Montgomery County, Md., building contractor and construction engineer, died March 4 in Washington, D. C. He was educated at George Washington University. During World War II he worked for the Federal Works Administration as construction engineer.



# Mobilization—

## Sharp Turn for Construction

The moment didn't have the dramatic impact of a Wilson or a Roosevelt solemnly calling for a declaration of war.

But when an unfamiliarly grim Harry S. Truman spoke to the nation's radio listeners Dec. 16, 1950, that moment had a special impact for the construction industry.

What Mr. Truman did was proclaim a National Emergency.

With that proclamation, the construction industry knew for sure that it must follow a new road and a long one—a road that would narrow progressively with the restrictions imposed by a defense economy.

The new route was Mobilization Road.

Until part of the industry started down that road, soon after fighting began in Korea, construction had been rolling fast along the broad no-speed-limit highway of post-war expansion. A large part of its men, machines and materials had been racing to meet the demands of an expanding economy that kept demanding more space, more buildings, more transportation facilities, more machines.

There was little, if any, slack in the construction economy. And what there was pulled taut under the strain of the drive for private industrial building that followed the outbreak in Korea. In August alone, $130 million worth of work was placed in the backlog of industrial work in the planning stage; the figure was $200 million in September; $402 million in October; $550 million in November; $806 million (a record) in January, 1951.

If the enormous power of this country's construction machine was to be turned to the purposes of a nation on a near-war footing, something had to be done—and quickly—to turn the machine off the post-war expansion road and onto the route of mobilization.

For this is the industry that must create the essential services for the rest of the economy. This is the industry that must provide the roads and the trackage and the waterways

**MACHINES—Tough problem for construction will be to obtain new machines, keep the old ones in running condition.**

to bring out the materials. This is the industry that must build the new plant to produce the goods. This is the industry that must keep the power, water supply, waste disposal services operating. This is the industry that will be in the first line of defense should the homeland be attacked.

• **Challenge**—Here was a direct challenge to construction, and here was a job to do:

Construction would have to do a face-about, away from the many and the small jobs of roaring peacetime boom to the fewer and bigger jobs that would be needed to be done for defense.

There would be nothing easy about it. Out of the demand for defense construction and out of the continuing work of the government (cut somewhat by the Bureau of the Budget, but still strong) would come some of the biggest years in construction history.

The industry would have to make that turnabout primarily under existing conditions. Manpower and materials would continue to be short. Added to these problems would be shortages in a field that only recently had ceased to be a problem—construction equipment.

By February, it was certain that the armed forces would order more than $700 million worth of equipment, for stockpiling and for use in their own construction work. By March 31, the Army engineers alone had bought $335 million of construction equipment out of existing appropriations, and they expected to spend a large sum more out of future appropriations.

Such a drain would be close to the entire annual capacity of the equipment industry (in 1948, equipment dealers sold $787 million worth).

For private construction then, it meant another exercise in ingenuity —make-do, keep-running, rebuilding— all in the interests of national defense.

• **Ready and willing**—Few construction men need to be told their vital role in a national emergency. The industry's long and honorable war record is far too fresh in their memories.

Long since, many a construction worker who had seen hard, dangerous service in World War II had joined the Organized Reserves of the armed forces. Many an engineer and contractor worked long hours to keep up a reserve commission or specialty—many another served on community, county, state or national advisory groups, giving his skill and knowledge to his fellows.

As good citizens and as prudent businessmen, the industry's practitioners did more: They foresaw the approach of a fork in the glory road and began to turn their energies toward making the turn; they offered their advice and counsel on matters little understood, but vitally important to the nation's welfare.

To this purpose the engineering societies, educators and many a hard-headed construction business man undertook to explain to the nation and the lawmakers the vital need for continuing the training of engineers and other technicians for a scientifically based economy.

On a more immediately practical basis, they formed the 27-man Construction Industry Advisory Committee to the National Production Authority, to consult on matters that would affect the industry as a whole; sanitary engineers got together to survey their industry, find out what its needs would be, present that side of the picture.

Construction has gone further: Engineers and contractors were among the first to volunteer for civilian defense; they promised their skills and their machines in case of need; they volunteered their time and their knowledge on problems that might be vital to the home economy.

Labor can help on its own—and has started in that direction. In addition to pledging its individual skills, it could—and did (in such centers as New York)—pledge another thing of great importance: Its willingness to keep working in time of emergency, to subordinate personal gain to the national good.

• **And able**—Construction could make the needed turn, in part at least, on its own. Almost with the first North Korean gunfire, many a construction man looked for a change in the affairs of his business, began to look for defense work.

The results of that veering toward the fork in the expansion highway are even now becoming apparent—in the great chips that are flying out of the backlog of proposed industrial work; in the fact that the economy generally is moving along Mobilization Road—and picking up speed as it moves.

• **Surprise**—But the volume of what had to be done to put the U. S. on a near-war footing was a surprise—to the nation as a whole, as well as to construction.

Construction knew well enough that it was doing a booming business, but it was flexible enough to keep up with the work on its books, or so people thought. Nearly everyone underestimated the strength of the continuing demand for goods and services, war or no war, incident or no incident. Few believed that much new war plant would have to be built, that many military establishments would have to be rebuilt almost from scratch.

A closer look at construction's books produced some answers.

Housing was a prime example: Racing to meet a demand that apparently couldn't be sated, the industry was producing real miracles. In 1950, despite curbs late in the year, a staggering 1,397,000 housing units were turned out.

Other great demands for construction's services (and materials) came from more traditional sources: The nation's highways, called upon to serve during a recent war, were sadly in need of repair and replacement.

To take a specific case, sanitary engineering work should be considered. When the government finally began to clamp down on construction, water and sewage works men did some checking, and came up with figures like this:

Critical materials for necessary construction and maintenance of water, sewage and industrial wastes installations in 1951—$600 million; waterworks for cities of 100,000 or more population—96 needed, cost $247 million; private water utilities, and projects planned by smaller communities—$360 million worth; municipal sewerage construction—$275 million; industrial wastes disposal—$100 million.

**• And steel**—On top of these more or less normal demands, there were some spectacularly bigger ones superimposed, notably steel, atomic energy.

The steel mills were already turning out more than 100 percent of their rated capacity (103 million ingot tons), but the steel makers and the planners knew it wasn't enough. They raised their sights—by three million, by ten million, by twenty million tons. Such a rise in productivity must inevitably use up more steel (to build the plants and facilities), must have construction's services.

Atomic Energy too—with emphasis on a newer and more terrible weapon (the Hydrogen Bomb)—wanted more from construction. $1,250 million worth, to be specific.

**• Help wanted**—And so, construction had to have help. It could strain every one of its many muscles to turn its huge machinery into Mobilization Road, but it needed an extra hand on the wheel.

**MANPOWER—Skilled workers in particular, but others too, are going to be harder to get—and harder to keep.**

Even so flexible a machine as construction has built would snap under the enormous stresses put upon it by such demands.

The answer had to be controls: Controls on the materials, the equipment and the type of work the industry could do.

**• And so, controls**—Controls were an obvious step from the moment the U. S. decided to step into Korea. It was painfully apparent that if the military took even a fairly small percentage of the steel, for instance, demand for what remained would inevitably skyrocket the price. It was just as apparent that despite its giant strength, construction would have to be directed and helped to get the materials and the manpower that it would inevitably need.

Now, there are several ways to get controls: You can issue a blanket order, clamp down on everything at once. Or, you can take it slowly, in steps.

The government chose the second course—a three-step method that could be called a "soft", "hard" and "harder" period.

## CONTROLS—SOFT

First point of attack was housing. Booming along (true enough, under the blessing and the prodding of the government itself) it was occupying an increasing portion of construction's time, taking huge amounts of materials that would be needed elsewhere. (The average small house needs 12,000 board feet of lumber for framing and sheathing alone; four tons of steel; wiring; copper sheathing; roofing materials, cement.)

So in July, while Congress began hearings on the President's request for a sweeping defense powers bill, Mr. Truman began whittling away at housing.

Drawing on his discretionary powers in the Veterans Administration and the Housing and Home Finance Agency laws, he halved the amount of mortgage money Federal Housing Administration could insure under the Housing Act of 1950. That act authorized $1,250 million of insured loans—Mr. Truman would approve only $650 million. At the same time, no-down-payment loans to veterans were abolished, and other down payment requirements were increased.

It was expected that these restrictions would begin to show their effects in about three months—and money volume figures did appear to respond in a spotty fashion.

But housing apparently was going to die hard—if it died at all. In spite of the curbs, it rolled right along, climbing to the 1,397,100 figure.

• **Regulation X**—So another attack had to be made. The attackers stayed with their original line—they clamped down further on money supply.

Under provisions of the Defense Production Act of 1950 (ENR Sept. 7, 1950 p. 25), a Presidential order gave overall control of financing new construction to the Federal Reserve Board. There was one important qualification: On regulations involving residential property, FRB must have concurrence of the Housing and Home Finance Agency.

First result of this arrangement was Regulation X—a credit-curb order issued by FRB and HHFA Oct. 12.

First applied only to owner-occupied housing, Regulation X gave promise of slashing 1951 housing starts. It called for down payments ranging from 10 percent of purchase price (on a $6,000 house) to 50 percent (on a $25,000 house). Veterans' rates were set somewhat lower; maturity periods were shortened—generally from 30 years down to 20 years. The regulation later was extended to apartment houses, later still to commercial buildings.

But, in answer largely to protests from labor leaders and veterans' groups (who said the credit curbs were making it impossible for a wage earner to buy a home, while other things were being allowed to continue without check) the regulation was modified in mid-November.

The modification: Originally, the restrictions were to apply to work "substantially committed" by August 3. The relaxation allowed all work committed before Oct 12 to be financed under pre-Regulation X down payment and maturity conditions.

• **Objective**—The objective of this

## Kind of business—not dollar volume—is big economic fact

There won't be much lessening of the dollar volume of business for the construction industry under mobilization. There is, in fact, every indication that for 1951 at least, there may be greater volume.

The big economic factor for the industry will be the **kind** of business, rather than the money value.

That, plus a couple of lesser—but important—points stands clear from the welter of facts, statistics, claims, complaints and forecasts that surrounds any attempt to evaluate the economic impact of mobilization on this industry.

Other major points are more obvious: Like all industry, construction is already plagued by a rising inflation of its costs; materials, and more particularly machinery, will be shorter; manpower will get shorter still.

• **Plenty of business**—In 1950, construction did a total dollar volume of business estimated at the seemingly fantastic figure of perhaps $35 billion, including maintenance and repair.

It seems obvious now that between them the needs of defense industries and the military will take up any slack that might be created as a result of the various controls and restrictions on other forms of construction work.

For example, the military plans to commit something like $2 billion for construction of bases and facilities in the U. S. by June 30, figures on spending between $8 and $9 billion by the end of 1953 for this purpose. Of the total for 1951, perhaps $800 million will go to overseas work.

The Atomic Energy Commission, with plans already under way for a $260 million plant in South Carolina (to produce tritium) and a $500 million plant in Kentucky (to produce U-235), and a third facility to make the H-bomb, will contribute heavily.

The defense industries—notably steel—would also contribute heavily to the total volume. Steel planned capacity expansions of up to 14,000,000 ingot tons—a program that was expected to cost more than $1.5 billion in the next year and a half. Aluminum makers came up with an even more ambitious program, proportionally. They planned to up their capacity by nearly 100 percent (946,000 tons) by the end of 1952.

The electric utilities—foreseeing enormously increased demands for their power, would follow suit.

And throughout the country, the plans of other manufacturers—airplane makers, automobile makers and their suppliers, warehouses and many others—were already starting a mushroom growth of new plants.

• **That's not all**—That isn't nearly all.

Although cut somewhat in an effort to meet the defense needs, the government's own regular construction program will go ahead. The government chopped about $175 million out of its requests for such work, but that still left quite a bit:

Rivers and harbors work will still entail expenditure of $149 million; flood control, $328 million; the Bureau of Reclamation will still spend $224 million.

Housing will drop, from the 1,395,100 starts of 1950 to something like 800,000 units this year—but that's still a lot of houses.

Highway work and highway maintenance, and the construction of community facilities would have to go ahead—even with some government help.

• **Change of pace**—The change in type of work is obvious—from small jobs to big jobs, from prime contractor even to sub contractor. Such a change is going to be a hardship on many construction firms, and on many of the individuals engaged in the work. There just aren't going to be as many houses, small sewage plants, waterworks to build. There are going to be very few stores and garages to build, few office buildings, no bowling alleys or racetracks.

Inevitably, skilled construction crews will have to be broken up, machinery bought for one purpose used for another, methods of estimating work changed. Substitute materials will have to be found, tested and used. The buildings that are built (like those in World War II) will have to be simpler, more functional. The emphasis must go more heavily on ingenuity and know how.

• **Change of base**—Harder to absorb for much of the industry is the shock of a definite shift of location that has shown up during the past year.

In the postwar years, all six construction regions into which the U. S. is divided (New England, type of control was clear enough:

To free materials and manpower for work in more essential places. Housing could not be stopped without harm to the economy, but planners felt that it could be curtailed sharply with safety.

It was a thing that had to be done—both to help construction make its turn, and to give government the chance to decide what the nation had gotten into, what it would need; also to permit the government to set up an organization to handle the controls effort.

• **Next step—allocations**—The 1950 production act contained five separate titles, one of which was authority to establish priorities and allocations. This title provided that producers could be ordered to accept defense contracts, putting them ahead of all others; materials and facilities could be allocated; there would be no hoarding of materials declared scarce.

As far as construction was concerned, much of the responsibility for execution of priorities and allocations was passed to the Department of Commerce, which was ready with a new sub-agency: The National Production Authority, under William Henry Harrison, former president of the International Telephone and Telegraph Co.

Weeks before the production act became law, Commerce began organizing NPA, following the President's expressed determination to keep control of the defense effort within the established government agencies where that was found to be possible.

NPA began with two divisions: An Office of Requirements—the top allocator—which was to add up the demand for critical materials and balance supply and demand; and an Office of Industry Operations, which was to be the claimant agency for most industries and the one that parceled out allocations of those industries' output. (A claimant agency decides what materials not under its own allocation control are needed by industries under its wing.)

Interior also had claimant and allocation duties—for the power, petroleum and solid fuels industries.

Subsequently, NPA set up a unit that would be of major interest to construction—the Construction Controls Division.

Middle West, Far West, South, West of Mississippi and Middle Atlantic) showed construction gains.

But the South, Far West, and the area West of the Mississippi showed gains doubling and tripling their own figures pre-war, and far outdistancing the older sections of the country.

Basic economic forces caused the shift: Population trends and the rapid growth of incomes and industry.

In the Far West, the seven states that comprise the area increased their populations almost four times as fast as the U. S. as a whole (bringing with it a huge new demand for housing and commercial facilities); personal incomes in the area jumped accordingly.

Growing areas—coupled with climatic and certain other advantages (such as cheap power, cheap land) draw industry with them. Mobilization is expected to accelerate the trend.

That won't mean, of course, that the East will be denuded of people and work. But eastern contractors can't look forward to as large a share of the pie.

• **Not so bad**—When it comes to materials, construction actually was better prepared for the rearmament effort early in 1950 than it had been when World War II got under way. Generally speaking, it was better off even than in 1942—the peak year of construction for war.

That was true, in spite of widespread shortages of materials. Because those shortages were caused by a roaring demand from a construction industry producing at record rates. That enormous demand for material had pushed the production of material far above previous records — in mid-August, for instance, the U. S. Department of Commerce's index of production of 20 basic materials showed an increase of 29 percent as compared to 1942 and 32.7 percent compared to 1949—and the index even then was rising rapidly.

**STEEL STARTS—Surrounded by company officials, Benjamin F. Fairless digs out first spadeful for U. S. Steel's $400 million Fairless Works (Wide World photo)**

Such a rate of production would indicate that materials shortages can be coped within a defense economy—if controls work properly, and if buyers use self-discipline.

• **Labor another story**—Construction labor was already tight when Korea started—and it shows every sign of getting tighter still.

When the U. S. got involved in World War II it had something like eight million unemployed—and vast reserves of women, youngsters and older people who could be tapped to fill in any gaps.

But in July, 1950, there were less than three million people unemployed; there were already 17 million women working (compared to 12 million when WWII started); and many of the youngsters would not be available because of the demands of the armed forces.

Skilled labor will be the hardest hole to fill, anyway, and particularly for construction.

The way to replace skilled labor, of course, is to use more machines. And machines will be extremely hard to get too—with the military already holding what amounts to a lien on nearly the entire production of the machinery manufacturing industry (see also p. 76).

## THE CLAIMANT AGENCIES AND CATEGORIES

1. **Secretary of Interior:**
    Petroleum, gas, solid fuels, electric power, construction and maintenance in connection therewith, fishery, minerals and metals.
2. **Secretary of Agriculture:**
    Food, domestic distribution of farm equipment, fertilizer, veterinary supplies.
3. **Commissioner of Interstate Commerce, (Administrator of Defense Transport):**
    Domestic Transportation, storage, port facilities.
4. **Secretary of Defense:**
    Military needs, equipment and supplies, military construction.
5. **Secretary of Army:**
    Civil construction projects under Army jurisdiction.
6. **Chairman, Atomic Energy Commission:**
    AEC programs.
7. **Martime Administrator:**
    Coastwise, intercoastal, oveseas shipping, merchant ship construction and repair.
8. **Commissioner of Public Roads:**
    Highway construction, maintenance.
9. **Administrator, Federal Security Agency:**
    Schools and hospitals other than veterans, supplies and equipment in fields of health, education, welfare, etc.
10. **Administrator, Veterans Administration:**
    Veterans hospital program.
11. **Administrator, HHFA:**
    All housing construction, alteration or repair.
12. **Administrator, General Services Admin.:**
    Needs of federal agencies not otherwise covered.
13. **Assistant Administrator, NPA, for Industry Operations:**
    Needs of all industries and businesses, including wholesale and retail trades, and construction and services industries not otherwise covered.

(These agencies present requirements to the Secretary of Commerce, with respect to materials and facilities placed under their respective jurisdictions)

## CONSTRUCTION MOBILIZES: THESE AGENCIES AND KEY PERSONS GUIDE IT

**Independent:**
NSRB—National Security Resources Board, J. Stuart Symington, Chairman
    Scientific Manpower Advisory Commission, Charles A. Thomas, Director
ICC— Interstate Commerce Commission
DTA— Defense Transport Administration, James K. Knudson, Executive Director
ODM—Office of Defense Mobilization, Charles E. Wilson, Director
    Assistants: Gen. Lucius D. Clay, Sidney J. Weinberg
DPA—Defense Production Administration, W. H. Harrison, Administrator
ESA—Economic Stabilization Agency, Eric Johnston, Administrator
OPS— Office of Price Stabilization, Michael V. DiSalle, Director
WSB— Wage Stabilization Board, Cyrus Ching, Chairman

**Department of Interior:**
PAD—Petroleum Administration for Defense, Oscar L. Chapman, Administrator
DMA—Defense Minerals Administration, James Boyd, Administrator
DEPA—Defense Electric Power Administration, Clifford B. McManus, Administrator
DSFA—Defense Solid Fuels Administration, Charles W. Connor, Administrator

**Department of Commerce:**
NPA—National Production Authority, Manly Fleischman, Administrator
    Facilities & Construction Bureau, Frank Creedon, Asst. Administrator
        Building Materials Division, John L. Haynes, Director
        Construction Controls Division, Rufe B. Newman Jr., Director
        Tax Amortization Division, Ross A. Gridley, Director
        Building Industrial Plant Expansion Division, W. E. O'Brien, Director
        Loan Division, Harvey M. Harper, Director

**Department of Labor:**
ODMA—Office of Defense Manpower Administration, R. C. Goodwin, Exec. Director

• **Defense Orders**—Among the things that were obvious at the start was that priorities of some kind would have to be established to assure materials for work of the greatest urgency.

But nobody wanted to call them priorities, and neither necessity nor organization were sufficiently advanced to accommodate a complicated system.

So National Production Authority came up with a single-band priority that it called the Defense Order (a name immediately shortened by common usage to the initials, DO).

DO's worked this way: Attachment of a DO to an order for steel, for instance, was a direct order to the vendor that this particular requisition must go to the top of the list, ahead of any non-defense work on the books.

The DO's originated with NPA, but for convenience were delegated to defense contracting agencies, including units of the Department of Defense, the Atomic Energy Commission (and later) the National Advisory Committee for Aeronautics, the Coast Guard, and AEC contractors (for plant construction).

In the case of construction, when a job qualified for a DO (any defense job qualified) the contractor received his priority from the contracting officer. This DO could be used by subcontractors, too, to obtain materials.

The DO is two-edged, in that it also requires contractors to push DO jobs ahead of any others.

There were troubles almost at once—the first of them arising out of the fact that the Army began to issue DO's to contractors on hospitals the Army was building for the Veterans Administration. VA, which also was building hospitals, set up a howl to be included. Army solved that one by withdrawing hospital work priorities.

There were other kicks too—one over the question of allowing DO's to contractors building Wherry Act housing on army posts—but the Defense Orders were effective enough to keep most construction people happy into the beginning of 1951.

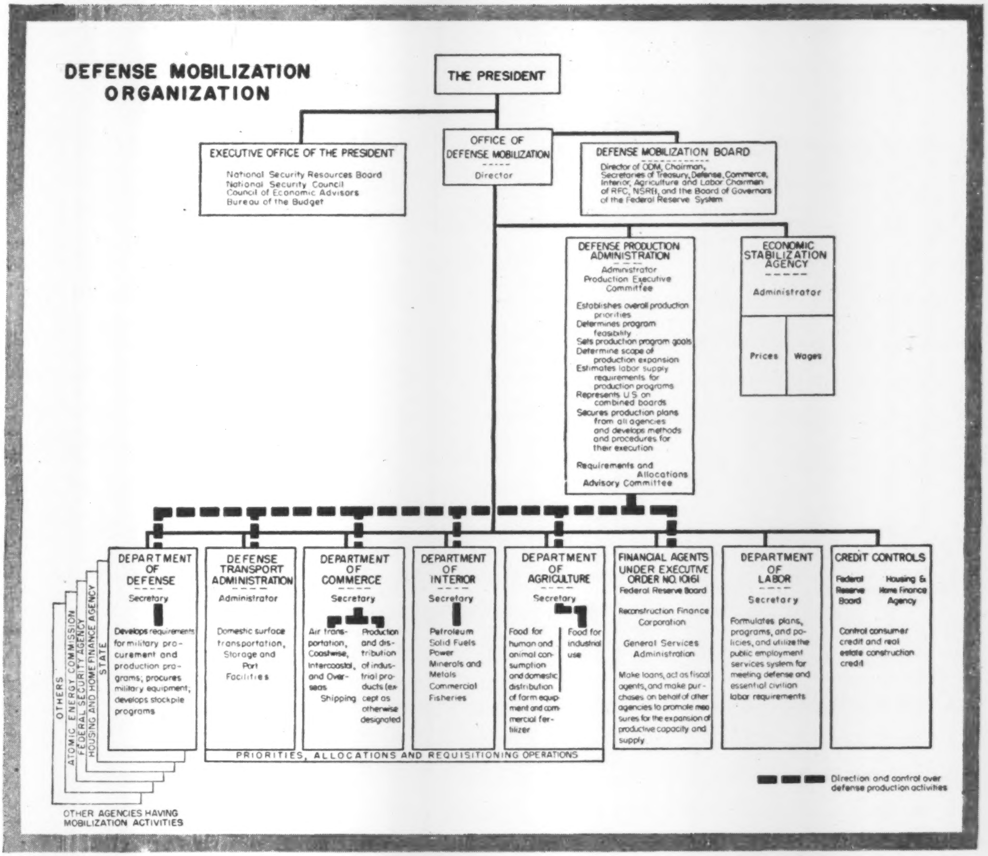
• **Wages and prices**—Price stabilization, coupled with wage stabilization, was the subject of another division of the Defense Production Act.

The President was given authority to order price and wage ceilings. But the act stated that the President first should seek voluntary industry and industry-labor agreements to hold the wage-price line.

So there was created the first new independent agency under the National Production Act—the Economic Stabilization Agency (under Alan Valentine)—to set wage-price policy, promote voluntary stabilization measures and impose controls if necessary. ESA had two sub-agencies: Price Stabilization (under Michael V. DiSalle) and Wage Stabilization Board (under Cyrus S. Ching).

There were bugs in the plan. As long as stabilization remained voluntary, price and wage provisions of the act didn't mean much; as long as Mr. Valentine did not delegate needed authority, Ching's board for settlement of labor disputes (three members from industry, three from labor, three representing the public) could accomplish little.

Construction labor did its part in these preliminaries to actual control. From a meeting with WSB officials, at Miami in January, came plans for formation of a nine-man tripartite board that would stabilize wages, adjust wage and working conditions dis-


THE PRESIDENT
EXECUTIVE OFFICE OF THE PRESIDENT
National Security Resources Board
National Security Council
Council of Economic Advisors
Bureau of the Budget
OFFICE OF DEFENSE MOBILIZATION
Director
DEFENSE MOBILIZATION BOARD
Director of ODM, Chairman, Secretaries of Treasury, Defense, Commerce, Interior, Agriculture and Labor Chairmen of RFC, NSRB, and the Board of Governors of the Federal Reserve System
DEFENSE PRODUCTION ADMINISTRATION
Administrator
Production Executive Committee
Establishes overall production priorities
Determines program feasibility
Sets production program goals
Determine scope of production expansion
Estimates labor supply requirements for production programs
Represents U S on combined boards
Secures production plans from all agencies and develops methods and procedures for their execution
Requirements and Allocations Advisory Committee
ECONOMIC STABILIZATION AGENCY
Administrator
Prices
Wages
DEPARTMENT OF DEFENSE
Secretary
Develops requirements for military procurement and production programs; procures military equipment; develops stockpile programs
DEFENSE TRANSPORT ADMINISTRATION
Administrator
Domestic surface transportation, Storage and Port Facilities
DEPARTMENT OF COMMERCE
Secretary
Air transportation, Coastwise, Intercoastal, and Overseas Shipping
Production and distribution of industrial products (except as otherwise designated)
DEPARTMENT OF INTERIOR
Secretary
Petroleum
Solid Fuels
Power
Minerals and Metals
Commercial Fisheries
DEPARTMENT OF AGRICULTURE
Secretary
Food for human and animal consumption and domestic distribution of farm equipment and commercial fertilizer
Food for industrial use
FINANCIAL AGENTS UNDER EXECUTIVE ORDER NO. 10161
Federal Reserve Board
Reconstruction Finance Corporation
General Services Administration
Make loans, act as fiscal agents, and make purchases on behalf of other agencies to promote measures for the expansion of productive capacity and supply
DEPARTMENT OF LABOR
Secretary
Formulates plans, programs, and policies, and utilize the public employment services system for meeting defense and essential civilian labor requirements
CREDIT CONTROLS
Federal Reserve Board
Housing & Home Finance Agency
Control consumer credit and real estate construction credit
PRIORITIES, ALLOCATIONS AND REQUISITIONING OPERATIONS
STATE
HOUSING AND HOME FINANCE AGENCY
FEDERAL SECURITY AGENCY
ATOMIC ENERGY COMMISSION
OTHERS
OTHER AGENCIES HAVING MOBILIZATION ACTIVITIES
Direction and control over defense production activities

DEFENSE MOBILIZATION ORGANIZATION

putes, jurisdictional disputes, however, would continue to be handled by an existing labor-management board).

• **Building pushed, too**—Through another defense act title, Expansion of Productive Capacity and Supply, the government also was trying to encourage certain types of construction that would contribute to the war effort.

Through guaranteed loans to expand output, long-term purchase contracts by the government and other means, the objective was to stimulate marginal production and development of new resources.

Up to $2 billion was authorized for the expansion of output programs, with Federal Reserve Banks acting as fiscal agents for guarantees of loans (V-loans) that financial institutions made to expedite production. Actual guarantees would be made by the contracting agencies of the government.

Additionally, the Reconstruction Finance Corporation would make direct government loans to private enterprise for expansion of capacity, development of processes and production of essential materials.

• **Change needed**—But these attempts to bring the nation's economy into line—and to help construction turn its corner—began to show signs that they weren't nearly adequate.

Housing went right on booming and so did other branches of construction. And the needed materials kept right on disappearing into a lot of places that had little to do with mobilization.

The time had come for a change.

And so came the "hard" controls, largely in early 1951, some in late 1950.

## CONTROLS—HARD

There is no particular key date for the "hard" controls, because they developed—as did a good deal of the rest of the mobilization program—as necessity arose.

First were the "M" regulations.

• **M orders**—These orders were developed as an adjunct of the DO orders, because it was apparent that simply ordering a producer to give priority to an order wasn't enough. The producer himself had to have certain materials—and the supply of those materials already was showing signs of growing short.

So, the National Production Administration began the allocation called for under the Defense Production Act, it's M orders taking the form of percentage maximums to DO business, end-use restrictions, and cutbacks.

The first such order, M-1, directed the steel companies to give maximum of only 5 to 25 percent of their output in different types of steel to DO work.

By early in December, the percentages were changed to 5 to 100 percent. Lower percentages applied to a few carbon steel products like reinforcing bars and drawn wire; highest percentage went to such items as tool steel and rolled alloy armor plate. (A similar order—M-5—later was applied to aluminum).

**• Stop work**—But it was a second type of M order—end-use restrictions—that caught the publicity, and was the first real "hard" control.

That order was M-4. It was designed to stop "frivolous" construction—amusement parks, bowling alleys, theaters. Affecting all new starts in this category, M-4 was not intended to cut out much construction (perhaps $500 to $750 million from an annual overall volume of more than $20 billion). Rather, it was a move to placate labor unions and veterans, who had been complaining that there was too much "business as usual."

But the order was badly worded, and the construction industry protested. The order could be read as a warning that NPA would—if necessary—stop construction work on any or all building jobs that do not further the defense effort.

Cogent spokesman for the industry was the Associated General Contractors of America, which asserted that no investor or builder would risk money in a new project under such a threat. AGC urged clarification that would remove the threat, and offered to bring construction men for a conference in which they would advise NPA's administrator on a useful clarification.

**• Backtrack**—The conference was held, and shortly thereafter NPA issued a modification to M-4's "warning" rider.

Said NPA: "In the event that increasing material shortages clearly indicate the necessity for such action, in the national interest, NPA may further limit the commencement of construction of additional types of projects which do not support the defense effort or increase the nation's productive capacity."

Contractors generally gave quick approval to the amendment; bankers and lending institutions were generally pleased, but indicated they would scrutinize future construction loans even more carefully.

**• Orders flow on**—The M-orders came faster.

M-6 guaranteed warehouses their historical share of steel from what was left after DO's were satisfied to the specified percentages, warehousemen were required to take care of their regular customers in historical proportions, too.

M-7, issued in November, was a conservation order, cutting back civilian use of aluminum by 35 percent. Subsequently (in January) the cutback was reduced to 20 percent for January and February, 25 percent for March, 1951.

Other M orders controlled other strategic materials—cobalt, tin, nickel, zinc, chlorine, and rubber.

**• And copper**—The order that promised to hit construction hardest was M-12—a restriction on copper. Under it, many copper-bearing items—wiring, valves, flashing—items that builders considered essential to almost any type of work, were affected. It said that in January, 1951, builders could use for non-defense work only 85 percent of their average monthly use of copper during the first half of 1950. By March, the percentage would drop to 80.

The cut was significant—construction uses 25 percent of the total available U. S. copper supply, which amounted to 1,500,000 tons in 1950.

M-12 was followed, early in 1951,

## Civil Defense—New job for construction industry

Construction has a brand-new job to do—on top of the work it will have to do to build the plant and facilities for the defense effort.

The job is civil defense.

For the first time since the War of 1812, there is now the possibility of large-scale enemy attack on the U. S. homeland. And such an attack more than likely won't be by ship-based armies landing on American shores, but rather by means of air armadas that will have one objective: To destroy this nation's productive capacity and its will to fight.

Such an attack must inevitably be directed against major metropolitan and manufacturing centers—to destroy the factories and to so disrupt community facilities and terrify the civilian population as to make impossible further operation of the city as a center of activity.

**• No precedent** — Construction's role in building up the defense establishment is well established in recent experience. But for civil defense—just the part considered in cleaning up the mess and keeping essential services running (let alone building shelters)—it's another matter. No European country in World War II had anything like the tools that are in the hands of the American constructor.

**• Start from scratch**—The U. S. industry must start from scratch.

Because of their equipment, manpower and know-how, contractors, engineers, architects, and their coworkers are able to take a leading part. Because the contractors are already organized into local, state and national groups, they are all the more valuable. The professional societies and the labor organizations parallel (to a large degree) this three-level organization.

But all of their know-how, all of their machines, all of their organization, won't do much good in case of an emergency, unless the respective components know exactly what to do—and unless their activities are carefully meshed with other defense activities long before an actual emergency arises. There won't be time for planning while an attack is in progress.

**• How to do it**—First step (suggested by the Associated General Contractors in a recently-released report to its 112 chapters) should be for construction men to sit in with civilian officials on civil defense planning boards.

Because the contractor in his normal occupation is of necessity a coordinator who must organize the work of numerous subdivisions, he should fit well in such planning. AGC suggests that its chapters—as well as other contractor groups—appoint an outstanding contractor to be the construction industry's representative on such boards.

**• The man in charge**—Next step is to insist that a capable contractor be designated as general supervisor of any construction forces to be used in case of disaster.

Direction of such forces cannot be left in the hands of a member of the local civilian defense board, nor should it be left to a state or municipal officer. No one who is not possessed of intimate knowledge of the men, machines and methods of construction, should be given the job of directing those elements.

The New York Building Trades council has set the pace in this matter, in making available the 20,000 skilled workers it counts as members, for rescue, salvage and repair operations. This group has set up an organization parallel to with a new and no less stringent approach to copper controls: The percentage cutbacks were supplanted by sweeping end-use restrictions. These included cornices, doors, windows and their hardware, downspouts, gutters, pipe and fittings (with some exceptions), roofing, store fronts, ventilators, weather stripping and cabinet hardware. Prohibitions on these uses were to go into effect April 1.

**• No hoarding**—The defense act's provisions against hoarding were approached first on an inventory control basis. In September, NPA directed merchants in the fields of steel, aluminum, copper, lumber and other materials (including building materials) to give to NPA their inventory figures for the months of 1950—and to submit monthly reports from then on.

These figures actually became the basis for enforcement of the M-orders.

Then, in January, NPA placed the materials on an anti-hoarding list: Anyone who stored more of these materials than he needed for "reasonable demands, personal or home consumption", or who accumulated them "for resale at prices in excess of prevailing market prices", is subject to fine and imprisonment.

And still, it wasn't enough. The machinery was making the turn, but it was groaning mightily under the strain. One more step had to be taken.

## CONTROLS—HARDER

Toughest of all the controls was the wage-price freeze of Jan. 26.

It had taken more than a month—and some juggling of manpower and policy—to do it, but there was a logical follow-up of the President's Dec. 16 proclamation of a national emergency.

Building products and materials (blanketed under the catch-all title "all commodities") were to sell only at ceiling prices, regardless of existing commitments to the contrary. Prices were to be the highest charged in the period Dec. 19-Jan. 25.

Wages were pegged at the Jan. 26 level.

For construction, the most significant part of the freeze program was NPA's stoppage (as of Jan. 13) of all commercial construction. An extension of M-4, the order was that no commercial work could start before Feb. 15—and then might proceed only under a permit system.

**• Staff changes, and ODM**—Prior to the freeze order itself, a swift change in staff had been effected.

In the interim between Mr. Truman's Dec. 16 proclamation and the freeze order, the Office of Defense Mobilization was established, with Charles E. Wilson—former president of General Electric—as director.

With Wilson's appointment virtually as "Assistant President", and the establishment of the Defense Production Administration (under W. H. Harrison), the meandering mobilization program began to show signs of finding its bearings.

The Office of Defense Mobilization took over from the National Security Resources Board, which originally had received presidential authority to coordinate activities under the Defense Products Act. The new agency set up an organization table that made Harrison and ESA's Valentine the two most important men reporting to Wilson; took over powers over priorities, allocations, requisitions, loans,

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the city police command, with an opposite-number designated for each police commander in each of the city's five teeming boroughs.

**• Where and what**—More than this, machines that will be available in such an emergency must be designated, catalogued, and insignia of some kind prepared, so that the machines can be moved quickly through police and fire lines.

More, the men who will be available must be advised, must be trained, must also carry some means of identification. Their addresses and their whereabouts must be known. They must be familiar with pre-arranged signals that will call them to disaster scenes.

Planning, in fact, should be done on an area basis—with areas large enough to insure adequate forces—from outlying areas, should enough damage be done in one sector.

Included in the planning, too, must be solutions to such problems (and many others) as: Where to dump the refuse; relaxation of bans on use of highways by heavy equipment; provision of crews for servicing and repairing equipment; storage of whatever may be considered essential supplies.

**• Keep it up**—Toughest job of all (and it's one construction shares in common with all other civil defense components) is morale.

Americans have a long tradition of responding gloriously to an actual fight—of rising to meet emergency.

But the present emergency gives promise of being a marathon, not a sprint. It is an emergency—but there isn't any heavy shooting going on close to home.

And—without the spur of the flag-waving that's possible during wartime, the concrete demonstration of the threat constantly hanging over the people—the difficult job is going to be to keep up the interest of the people who will be involved.

One answer to that is constant drilling, constant practice in the job that may have to be done—however much everyone hopes the need will never arise. Another is certainly a constant stream of information on exactly how their organization is set up and how it functions, information on the possible kinds of attack and the best thinking on how to cope with them.

**• Progress**—Some start has been made toward the "planning from scratch."

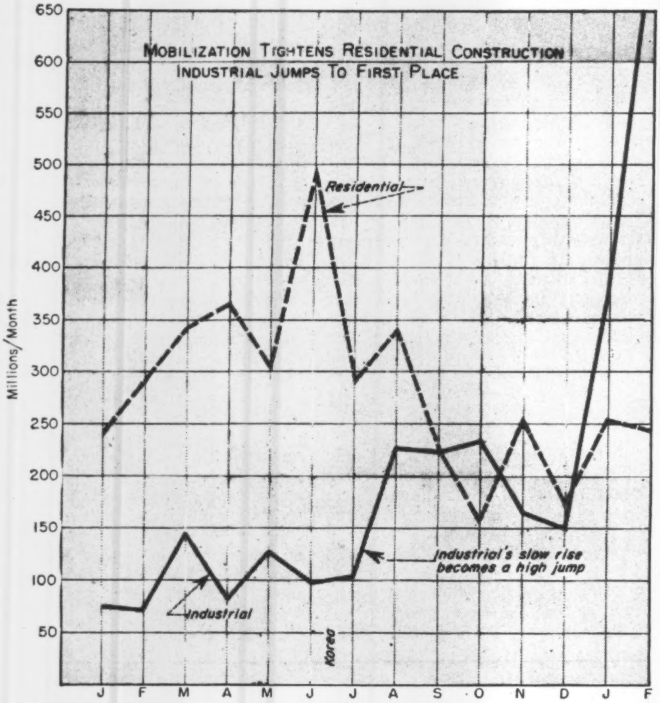
New York State, for one, has largely completed an inventory of the construction equipment its contractors control—an elaborate inventory, broken down by types and capacities of the machines, locations, and condition, among others.

Keeping the inventory up-to-date, by periodic reporting, is an important element of the New York plan, and a vital one to any inventory of construction tools for civil defense.

**• A long run**—On the subject of the duration of the present emergency, this much is beginning to be clear out of the government planning:

The U. S. is trying, for the moment, to fill in the gaps in its immediate defense set-up—build up armed forces sufficient for the nation's protection in any immediate emergency, and build the necessary productive capacity to support that armed force (now set at 3,500,000) as quickly as it can.

Once that "insurance" has been bought, the nation will set out to beef up its economy further—build an economy that could be expanded, if need be, to support armed forces three or four times the "insurance" force.



**INDUSTRIAL BUILDING took a long time to do it, but under the spur of government effort, it has far outdistanced housing.**

purchasing and certification of accelerated amortization for tax purposes.

**• Construction up**—By now, in NPA, construction had become one of the three main activities. The Facilities and Construction Bureau, under former Housing Expediter Frank R. Creedon, included the original Construction Controls Division administration of M-4.

Perhaps the most important change took place when Valentine stepped out of ESA, in preparation for the price-wage freeze.

Valentine, who was reluctant about delegating authority, and about a general freeze, was succeeded by Eric Johnston—former president of the U. S. Chamber of Commerce and lately Hollywood's movie-industry arbiter.

In the construction line, another juggle took place. James W. Follin, who had been serving as head of NPA's Construction Controls Division lost a battle for a longer freeze on commercial construction, and stepped out and back to his permanent job as special assistant to the administrator of GSA. He was eventually replaced by Rufe B. Newman, Jr., a Florida consulting engineer with administrative construction experience in the Federal Works Agency.

**• The details**—The effect of the commercial construction restriction would be to free materials for industrial work. That work was becoming more and more pressing—it amounted to $141,400,000 worth of new industrial contracts just in the one week before the stop order went into effect.

The order blanketed commercial work, preventing new starts, with the exception of supply facilities for food, fuel, oil, gasoline, coal and gas-distributing pipelines.

It would hold until Feb. 15, when heads of 14 regional offices and five district offices would be ready to make yes or no answers to NPAF-24 applications for permission to start commercial work costing up to $1,000,000. Bigger jobs would have to be approved by NPA's Construction Controls Division in Washington. Hardship cases would be considered.

**• Reaction**—Construction responded by deciding that the commercial freeze was necessary, and probably wouldn't do too much damage. The damage would take the form of temporary maladjustment of construction labor—skilled crews might have to be broken up to follow the pattern of industrial expansion. But apparently the hardship wouldn't be prolonged.

The freeze itself, of course, was no one-man thing. It was largely a product of the construction industry: The 27-man Construction Industry Advisory Committee worked with NPA's Facilities and Construction Bureau on the order's formulation.

**• Controlled materials**—The freeze was of course a real end-use restriction, just as were the controls on copper and aluminum. But end-use restrictions already looked like a stopgap.

Logically, the next move had to be actual control of the flow of materials. As a preliminary to such a procedure, called Controlled Materials Plan, NPA late in January directed claimant agencies to inventory their construction programs for equipment and materials requirements. Steel, copper and aluminum were the only components to be surveyed—the idea being that if the flow of these materials were controlled from mine into factory, demand for other critical materials would be limited automatically.

Inventory information was turned in to NPA March 1. By April 15, controlled-materials users will apply for third-quarter allocations through their claimant agencies.

The schedule aims at putting CMP into effect July 1.

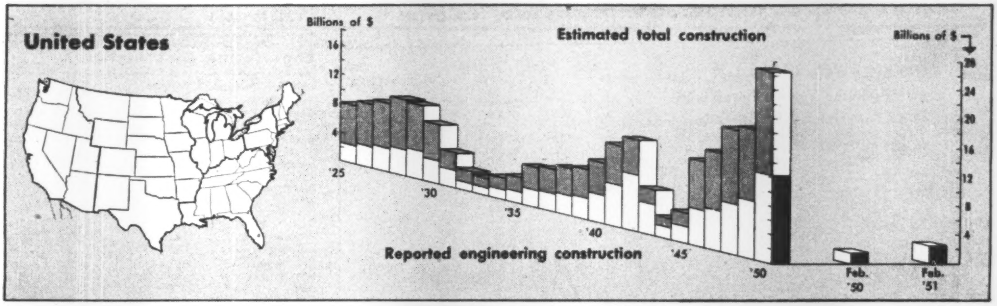
As corollaries, credit restrictions went on commercial construction Feb. 15; end-use restrictions on commercial jobs setting up a permit system in one category, could be extended throughout the industry, if necessary. The credit restriction, set up by the Federal Reserve Board, was this: The maximum amount that could be borrowed was 50% of the value of new construction; loan maturity maximum is 25 years.

**• Got to grow**—And so the picture was coming clear.

On its own, and because of (sometimes in spite of) the government's help, construction would make the turn into Mobilization Road. It would veer off with some strain—but the job would be done.

It would be a difficult job—curtailment of some few government works and of housing work would not compensate the growth indicated in military and industrial construction. Control machinery would help—but construction again would have to demonstrate its ability to grow.

The industry would do it, too.

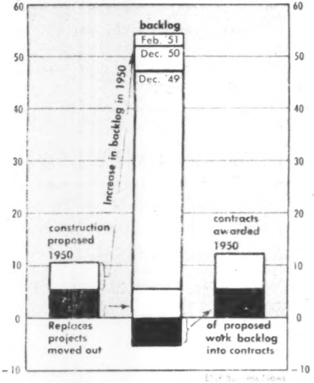


# Construction's capacity to produce

Construction, these days, crawls on its supply lines. The Regulation X credit restrictions and the M construction stop orders are for the sole purpose of diverting materials, from the types of construction that have been absorbing them at record rates, to the kinds of construction Defense authorities need to increase productive capacity. For the mobilization effort catches construction already close to reacord activity.

Last year construction blew the top out of almost every record on its books. New high marks were set—for contract awards, for backlog of work proposed but not yet under contract, for money available, for men employed, for machines bought and for materials shipped.

**Backlog – Proposed**



ENR Business News

Dollarwise, 1950 was the highest year on record for engineering construction. It was second to the 1942 peak however, in physical volume measured by the ENR Construction Volume Index. But even so 1950 saw 51% more heavy construction go under contract than was awarded in the prewar peak year of 1929, as measured by the volume index.

Construction can expand very rapidly, when materials are available. Compared with its depression low in 1933, engineering construction volume nine years later expanded five times to turn out war plant in 1942. From their WWII low in 1944, construction contract awards six years later, in 1950, had expanded four and a half times.

Construction has always been a feast or famine business that can expand rapidly—when it can get materials.

At the peak of the 1950 construction season, even before Defense mobilization got underway, supply lines became construction bottlenecks over a wide area geographically and for an inclusive list of materials.

Steel and all steel products, shapes, reinforcing bars, metal lath, sheetpiling, got scarcer and scarcer. Promised delivery dates receded so far into the future that they disappeared altogether in some cases and reinforcing and other steel went off the market in some areas. Now, of course, steel is completely controlled and available only on DO ratings.

A high percentage of 1951 industrial building construction is directed toward remedying this situation, see table on page 87.

The 1950 cement shortage was blamed on a shortage of railroad cars for shipping from the mill. But stocks got down to their lowest dip on recent record except for one month in 1947. And, in spite of record production of 226 million bbl. cement stocks at the start of 1951 were 10% below where they started 1950. Certificates of necessity have been granted to increase cement capacity.

The critical lumber shortage, that sent prices skyrocketing to new records in the summer and fall, was due in some measure to diversion of normal shipping facilities, both rail and water, to mount the Inchon landing in Korea. In large measure the lumber shortage was a result of the unprecedented housing boom.

Gypsum products, especially rock lath, were critically short in spite of the fact that production was at eight times its 1939 rate.

Housing topped all previous records in 1950 with starts estimated by the Bu. of Labor Statistics at 1,397,000. This unprecedented housing program held the spotlight during the first half of the year for its size and, during the second half, for federal

## Contracts awarded and engineering construction backlog* in 1950, also Jan.-Feb., 1951

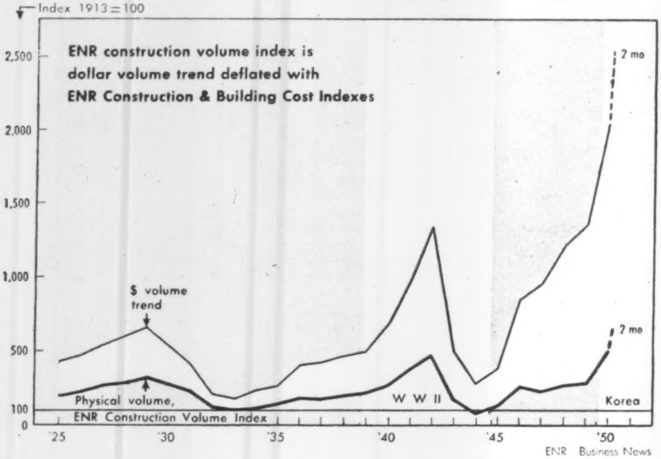
### as reported by Engineering News-Record and Construction Daily, thousands of dollars, (000 omitted)

United States contracts

| | Privately financed projects | | | | Publicly financed projects | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Industrial | Commercial buildings | | Un- | Water- | | | Earth-work | Streets, | Buildings | | Federal | Engineering construction | | |
| | Buildings | Residential | Other | classified§ | works | Sewerage | Bridges† | Irr.-drain. | Roads | Residential | Other | work | Private | Public | Total |
| U. S. 1950 | $1,682,822 | $3,117,084 | $975,105 | $1,255,819 | $214,785 | $287,416 | $369,344 | $416,618 | $1,268,333 | $358,815 | $2,405,466 | $1,896,631 | $6,670,476 | $5,681,131 | $12,351,607 |
| Chg '49-'50 | +77% | +70% | +70% | +56% | +4% | +4% | +3 5% | −21% | +41% | −2% | +76% | +60% | +73% | +32% | +51% |
| 2 mo '51 | $1,026,361 | $361,604 | $118,228 | $117,033 | $30,121 | $52,992 | $46,582 | $40,598 | $132,204 | $133,772 | $418,462 | $355,663 | $1,615,225 | $922,732 | $2,537,957 |
| Chg '50-'51 | +614% | −27% | −17% | +51% | −40% | +52% | +13% | −17% | +8% | +365% | +12% | +5% | +92% | +21% | +58% |
| **Backlog*** | | | | | | | | | | | | | | | |
| U.S. Dec '50 | $5,753,133 | $6,962,583 | | $10,205,778 | $1,386,730 | $2,192,325 | $1,692,117 | $7,281,735 | $4,598,234 | $12,050,414 | | $9,754,199 | $18,250,104 | $33,862,945 | $52,113,049 |
| U.S. Feb '51 | $6,849,529 | $7,124,406 | | $10,867,643 | $1,403,384 | $2,225,664 | $1,790,028 | $7,336,616 | $4,749,345 | $12,292,048 | | $10,308,577 | $19,739,193 | $34,899,470 | $54,638,663 |

* Backlog of engineering construction proposed but not yet put under contract. † Incl. private. § Incl. public.

## Dollars invested compared with physical volume



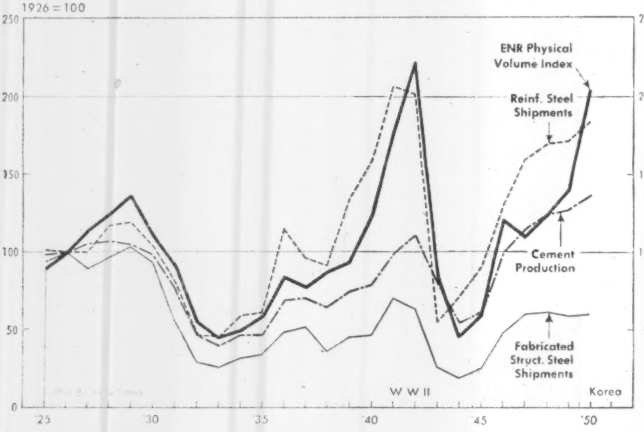
ENR Business News

efforts to slow down the monster with credit restrictions.

The unprecedented industrial building boom that got underway in August has carried over into 1951 with even more spectacular speedups in putting new productive plant under contract. This rapid expansion in productive capacity has been aided and abetted by fast tax write-offs on plants for which certificates of defense necessity could be obtained, first from the National Security Resources Board, and now from the Defense Production Administrator. (see also page 157) Applications are on hand for $3 billion more in plant equipment and construction, if approved. The proposed construction backlog of in-

(*Continued on page 87*)

## Construction materials shipments and production indexes compared with engineering construction volume index



# High-low records

## Engineering construction

Contracts awarded, $ millions

| | High year | Low year | Incr. |
|---|---|---|---|
| ENR Vol. Index | 546—'42 | 110—'33 | 396% |
| | 503—'50 | 110—'44 | 357% |
| Total, ENR ... | $12,352—'50 | $1,730—'44 | 614% |
| C'l & res. bldg. . | 4,092—'50 | 140—'44 | 2,823% |
| Indust bldg ... | 1,683—'50 | 167—'43 | 908% |
| Public bldg ... | *2,764—'50 | 414—'46 | 568% |
| Highways ..... | 1,268—'50 | 196—'44 | 547% |
| Bridges ....... | 370—'50 | 17—'44 | 2,076% |
| Unclass ...... | †1,256—'50 | 354—'46 | 255% |
| Ethwk. Wtrwys. | 524—'49 | 47—'43 | 1,015% |
| Sewerage ...... | 287—'50 | 32—'44 | 797% |
| Waterworks ... | 215—'50 | 33—'44 | 552% |
| New England .. | 497—'50 | 51—'44 | 875% |
| Mid Atlantic .. | 2,760—'50 | 267—'44 | 934% |
| South ........ | 2,658—'50 | 278—'44 | 856% |
| Mid West ..... | 1,845—'50 | 208—'44 | 787% |
| W. of Miss..... | 2,892—'50 | 338—'44 | 756% |
| Far West ..... | 1,700—'50 | 527—'45 | 223% |

* high post ww II, 3rd high on record, 1942—$4,880 (corrected for WPB cancellations)

† high post ww II, 2nd high on record, 1942—$1,750 (corrected for WPB cancellations)

## ENR Cost Indexes

| | | | |
|---|---|---|---|
| Construction ... | 529—12/50 | 283—1/43 | 87% |
| Building ...... | 390—12/50 | 227—1/43 | 72% |

## Housing

| | | | |
|---|---|---|---|
| Starts, BLS..thous | 1,397—'50 | 142—'44 | 884% |

## Construction money

$ millions

| | High year | Low year | Incr % |
|---|---|---|---|
| S & M bonds... | $3,119—'50 | $131—'43 | 2281 |
| Corp secur's ... | 2,701—'48 | 56—'43 | 4723 |
| Fed aid* ...... | 522—'50 | 132—'43 | 295 |
| Fed approp .... | 9,579—'42 | 1,066—'47 | 799 |

* Since start of WW II

## Men

| Year, aver | | Employment | Incr |
|---|---|---|---|
| High .......... | 1950 | 2,313,000 | 104% |
| Low, post WW II... | 1945 | 1,132,000 | ..... |
| Month, post WW II | | | |
| High .......... | 10/50 | 2,631,000 | 177% |
| Low .......... | 1/45 | 950,000 | ..... |

## Machines*

| shipments | | | | Incr |
|---|---|---|---|---|
| | 3rd high | 1950 | $109,006,000 | .... |
| Cranes, | high | 1948 | 158,586,000 | 95% |
| shovels | low | 1946 | 81,424,000 | .... |
| Road | 2nd high | 1950 | 117,470,000 | .... |
| constr | high | 1948 | 117,908,000 | 33% |
| equip | low | 1946 | 88,610,000 | .... |
| Tractor | high | 1950 | 58,769,000 | 191% |
| mtd equip | low | 1946 | 20,190,000 | .... |
| Tractor, | high | 1950 | 223,042,000 | 174% |
| track | low | 1946 | 81,356,000 | .... |
| Tractor, | high | 1950 | 24,779,000 | 98% |
| wheel | low | 1949 | 12,499,000 | .... |
| Port-well | high | 1947 | 11,426,000 | 156% |
| drill | low | 1950 | 4,472,000 | .... |
| Total | high | 1950 | $562,219,000 | 99% |
| all rept'd | low | 1946 | 282,783,000 | .... |

* compressors, pumps, concreting equipment all types, trucks not included. All figures are post World War II.

## Materials

Shipments, millions

| | High year | Low year | Incr |
|---|---|---|---|
| Cement, ..... bbl | 227.8—'50 | 94.3—'44 | 142% |
| Lumber, ..... bf* | 39.7—'50 | 28.9—'45 | 37% |
| Steel, struct, T... | 3.3—'29 | 0.8—'33 | .... |
| " " " .. | 1.93—'50 | 0.6—'44 | 222% |
| Steel, reinf, " .. | 1.67—'50 | 0.84—'45 | 99% |
| Brick* ......... | 6.35—'50 | 2.00—'44 | 218% |

* billions

# Material Shipments—By Years

| Item | Unit | 1929 | 1933 | 1939 | 1942 | 1945 | 1949 | 1950 |
|---|---|---|---|---|---|---|---|---|
| **Lumber, NLMA** | **Millions Bd. Ft.** | 35,952 | 16,300 | 25,811 | 38,946 | 28,869 | 31,981 | 39,719 |
| **Cement, US BuM** | **Thous. Bbl** | 169,868 | 64,283 | 122,651 | 185,267 | 106,398 | 206,193 | 227,788 |
| **Fabr. Struct. Steel, AISC** | **Thous. Tons** | 3,307 | 828 | 1,440 | 2,040 | 797 | 1,854 | 1,932 |
| **Reinf. Steel, AISI** | **Thous. Tons** | 1,079 | 409 | 1,214 | 1,845 | 835 | 1,573 | 1,674 |
| **Explosives, US Bu M** | **Thous. Lbs.** | 509,708 | 255,987 | 386,438 | 499,255 | 457,311 | 617,308 | 707,063 |
| **Brick, US Bu Census** | **Million Brick** | ........ | 860 | 3,319 | 2,929 | 2,375 | 5,252 | 6,348 |

## Industrial building contracts—record postwar expansion

**as reported in the Construction Daily and Engineering News-Record—($ in thousands)**

| | 1945 | | 1946 | | 1947 | | 1948 | | 1949 | | 1950 | | Jan.-Feb. 1951 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Value | No. | Value | No. | Value | No. | Value | No. | Value | No. | Value | No. | Value |
| **Transportation Service** | | | | | | | | | | | | | | |
| **Railroad** | 73 | $10,961 | 64 | $17,198 | 59 | $12,402 | 52 | $9,314 | 39 | $10,761 | 56 | $20,525 | 4 | $827 |
| **Automotive** | 237 | 15,512 | 377 | 33,544 | 279 | 26,392 | 402 | 47,989 | 272 | 31,449 | 274 | 45,231 | 52 | 11,584 |
| **Public Utilities** | 48 | 52,150 | 88 | 93,330 | 121 | 125,307 | 125 | 249,820 | 110 | 235,380 | 111 | 235,793 | 24 | 225,685 |
| **Process Industries**[1] | 438 | 245,129 | 595 | 499,302 | 518 | 292,544 | 420 | 401,144 | 369 | 276,715 | 541 | 507,765 | 115 | 165,089 |
| **Food Industries**[2] | 400 | 64,688 | 631 | 118,997 | 467 | 123,152 | 343 | 75,122 | 394 | 99,639 | 470 | 147,273 | 56 | 16,292 |
| **Metal Ref. & Rolg** | 31 | 18,218 | 29 | 39,833 | 38 | 46,215 | 25 | 61,139 | 20 | 35,087 | 40 | 184,457 | 14 | 462,168 |
| **Metal Working Plants** | | | | | | | | | | | | | | |
| **Auto Factories** | 42 | 41,790 | 29 | 29,390 | 13 | 11,526 | 11 | 8,016 | 15 | 33,701 | 23 | 130,545 | 5 | 41,200 |
| **Aircraft Factories** | 19 | 3,848 | 9 | 1,698 | 7 | 2,297 | 4 | 1,525 | 5 | 966 | 12 | 5,106 | 1 | 82 |
| **Foundries** | 32 | 2,333 | 32 | 5,693 | 22 | 2,838 | 14 | 5,209 | 13 | 2,355 | 22 | 18,017 | 5 | 836 |
| **Mach. & Mach. Parts** | 465 | 86,970 | 503 | 114,671 | 340 | 101,173 | 329 | 113,663 | 219 | 87,923 | 385 | 172,363 | 91 | 62,270 |
| **Radio & TV & Electronics** | 11 | 7,540 | 4 | 1,045 | 6 | 1,660 | 4 | 1,845 | 6 | 1,308 | 12 | 6,310 | 5 | 1,610 |
| **Textiles (excl rayon)** | 63 | 6,840 | 89 | 16,325 | 82 | 11,624 | 62 | 9,846 | 77 | 13,843 | 88 | 38,134 | 15 | 6,224 |
| **Wood Industries** | 53 | 8,592 | 96 | 10,391 | 48 | 8,121 | 46 | 8,116 | 40 | 4,963 | 56 | 11,298 | 16 | 2,649 |
| **Miscellaneous** | | | | | | | | | | | | | | |
| **Gen. Factories** | 556 | 65,742 | 917 | 122,647 | 687 | 92,317 | 618 | 101,102 | 580 | 113,028 | 832 | 156,530 | 145 | 29,124 |
| **Refrig., etc** | 63 | 4,857 | 85 | 9,187 | 32 | 4,637 | 9 | 1,704 | 15 | 2,859 | 12 | 3,475 | 5 | 721 |
| **Total, priv. financed** | **2,531** | **$635,170** | **3,548** | **$1,113,251** | **2,719** | **$862,205** | **2,464** | **$1,095,581** | **2,174** | **$949,977** | **2,934** | **$1,682,822** | **553** | **$1,026,38** |
| **Fed Owned Indust Plts** | .... | $183,731 | .... | $25,000 | .... | $15,899 | .... | $824,000 | .... | $247,147 | .... | $1,081,930 | 22 | 235,516 |

[1] Includes distillers. [2] includes breweries, frozen food plants and lockers.

dustrial buildings on record with Engineering News-Record totaled $6.8 billion in February, 1951.

Construction manpower hit a new high in 1950 with an average of 2,313,000 men employed on contract construction alone. This topped out at 2,631,000 in October, an increase of 177% over the contract construction working force of January, 1945.

Construction machines were in good supply in 1950 as a whole, but tracklaying tractors were on allocation. All construction equipment promises to be short in 1951 due to heavy commitments for military use. Shipments of excavating and earthmoving equipment alone amounted to $562 million in 1950, the highest year on record since the war.

Construction materials shipments set new high records in 1950 for most products. Cement producers shipped 227.8 million bbl, an increase of 142% over their 1944 war low. Fabricated structural steel shipments of 1.93 million tons were an increase of 222% over the 1944 war low but they did not approach the 1929 high of 3.3 million tons. Reinforcing steel shipments of 1.67 million tons were 99% higher than the 1945 war low. Shipments of 6.35 billion brick topped the war low in 1944 by 218%.

### Outlook for 1951

Originally, in Defense planning thinking, construction in 1951 was expected to be held down about 17% below the record of 1950 volume. Housing restrictions were designed to hold 1951 starts down to 850,000. This would work two ways, if they fell off too fast credit restrictions would be relaxed, if they didn't fall off enough, restrictions would be tightened.

Highway construction budgets indicate an increase of 2% in road and bridges construction and 10% in maintenance which would be an average increase of 4% in the overall demand on materials and equipment.

The big question mark is industrial building. It is already set for the highest year ever experienced, and there are more certificates of necessity to come.

The situation is confused, because industrial building has gone under contract in early 1951 at an unprecedented and unforeseen high rate. Judging by the backlog, and also by applications for fast tax write-offs, a high rate will continue.

Contracts awarded in the first half of 1951 should set a new alltime record, then slow down in the second half until some of the new capacity comes into production to supply the critical materials that now limit constructions ability to go ahead.

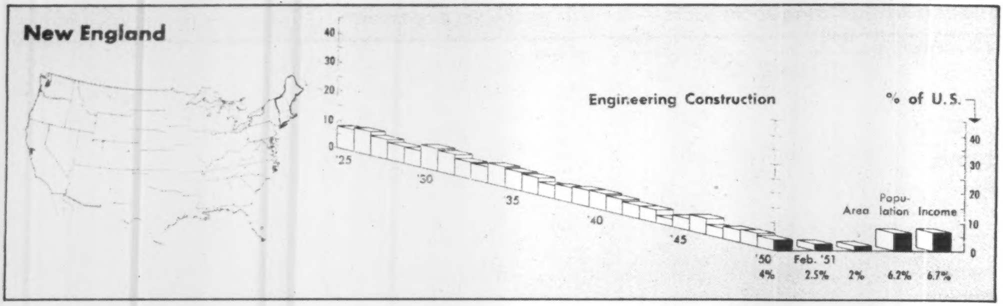
## State highway mileage, expenditures, budgets — 1950-1951

### Reported to Engineering News-Record Highway Executives of 39 states and District of Columbia, Expenditures, 1950 — Budget for 1951 — thousands of dollars (,000 omitted)

| | Mileage put under contract, 1950 | | | | | Bridges, grade crossing elim. struc. 1950 | New contract awards | | Maintenance by states | | Maintenance by contract | | New equipment | | Total construction and maintenance | | % change |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hard surf. incl. cement, bit. concr. asph. | Other bituminous | Gravel, stone or soil surfaces | Graded and drained | Total | | 1950 | 1951 | 1950 | 1951 | 1950 | 1951 | 1950 | 1951 | 1950 | 1951 | |
| **New England** | 88.4$^{1}$ | 124.4$^{1}$ | 2.0$^{1}$ | 5.5$^{1}$ | 220.3$^{1}$ | 124$^{1}$ | $32,926$^{1}$ | $41,505$^{1}$ | $38,178 | $38,866 | $2,318 | $2,895 | $2,981 | $3,728 | $73,422$^{1}$ | $83,266$^{1}$ | |
| **5 compar. sts.** | 88.4$^{1}$ | 124.4$^{1}$ | 2.0$^{1}$ | 5.5$^{1}$ | 220.3$^{1}$ | 124$^{1}$ | 32,926$^{1}$ | 41,505$^{1}$ | 25,678$^{1}$ | 25,866$^{1}$ | 318$^{1}$ | 395$^{1}$ | 1,131$^{1}$ | 928$^{1}$ | 58,922$^{1}$ | 67,766$^{1}$ | +15 |
| **Mid Atlantic** | 1,465.8 | 631.5 | 452.5 | 66.0 | 2,615.8 | 871 | 316,175 | 279,087 | 59,320 | 70,338 | 5,657 | 1,520 | 4,579 | 4,893 | 381,152 | 350,945 | −8 |
| **South** | 4,148.0$^{2}$ | 8,200.4$^{2}$ | 9,374.5$^{2}$ | 3,191.1$^{2}$ | 24,914.4$^{2}$ | 25,084$^{2}$ | 241,221$^{2}$ | 248,931$^{2}$ | 90,681$^{2}$ | 104,708$^{2}$ | 6,246$^{2}$ | 6,750$^{2}$ | 14,737$^{2}$ | 8,867$^{2}$ | 338,148$^{2}$ | 360,389$^{2}$ | +7 |
| **Mid West** | 2,449.3 | 2,345.5 | 961.1 | 348.5 | 6,104.4 | 294 | 173,611 | 187,092 | 58,549 | 60,504 | 18,494 | 18,955 | 3,718 | 4,772 | 250,654 | 266,551 | +6 |
| **West of Miss.** | 6,367.8 | 2,849.2 | 4,411.5 | 2,586.4 | 16,214.9 | 17,883.9 | 281,773 | — | 91,898 | — | 4,892 | — | 9,667 | — | 378,563 | — | |
| **10 compar. sts.** | 5,696.1$^{4}$ | 2,264.0$^{4}$ | 3,805.1$^{4}$ | 2,196.5$^{4}$ | 13,961.7$^{4}$ | 539.0$^{4}$ | 222,812$^{4}$ | 236,405$^{4}$ | 78,250$^{4}$ | 83,725$^{4}$ | 4,539$^{4}$ | 4,900$^{4}$ | 7,406$^{4}$ | 7,292$^{4}$ | 305,601$^{4}$ | 325,030$^{4}$ | +6 |
| **Far West** | 913.6$^{2}$ | 1,338.8$^{2}$ | 621.5$^{2}$ | 274.1$^{2}$ | 3,148.0$^{2}$ | 300$^{2}$ | 129,429$^{2}$ | 147,816$^{2}$ | 41,528$^{2}$ | 44,039$^{2}$ | 3,010$^{2}$ | 2,050$^{2}$ | 4,971$^{2}$ | 5,235$^{2}$ | 173,967$^{2}$ | 193,905$^{2}$ | +11 |
| **United States** | 15,432.9 | 15,489.8 | 15,823.5 | 6,471.6 | 53,217.8 | 44,556.9 | 1,175,135 | — | 380,154 | 402,180 | 40,617 | 37,070 | 38,803 | — | 1,595,906 | 1,580,086 | −1 |
| **Compar. sts.** | 14,761.2$^{9}$ | 14,904.6$^{9}$ | 15,217.1$^{9}$ | 6,081.7$^{9}$ | 50,964.6$^{9}$ | 27,212.0$^{9}$ | 1,116,174$^{9}$ | 1,140,836$^{9}$ | 354,006$^{9}$ | 389,180$^{9}$ | 38,264$^{9}$ | 34,570$^{9}$ | 36,542$^{9}$ | 31,987$^{9}$ | 1,508,444$^{9}$ | 1,564,586$^{9}$ | +4 |
| **% chg. from '50** | | | | | | | | +2 | | +10 | | −10 | | −9 | | +4 | |

° Exponents show number of states missing ● These states could supply only partial data: Massachusetts, Arkansas, Oklahoma ● These states could supply no data: West Virginia, Florida, Iowa, Wyoming, Utah, Nevada ● Michigan assembled data after a disastrous fire had destroyed many highway records.

## New England



# Contracts awarded and engineering construction backlog* in 1950, also Jan.-Feb., 1951

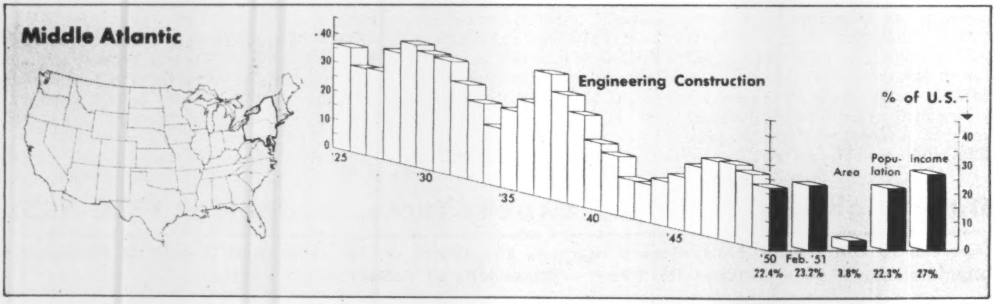
## as reported by Engineering News-Record and Construction Daily, thousands of dollars, (000 omitted)

### New England contracts

| | Privately financed projects | | | Publicly financed projects | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Industrial Buildings | Commercial buildings Residential | Commercial buildings Othe | Unclassified§ | Waterworks | Sewerage | Bridges† | Earthwork Irr.-drain. | Streets, Roads | Buildings Residential | Buildings Other | Federal work | Engineering construction Private | Engineering construction Public | Total |
| Me. | $102 | ........ | $2,474 | $2,179 | $211 | $805 | $2,269 | $549 | $4,828 | ........ | $2,086 | $4,310 | $2,601 | $12,920 | $15,521 |
| N. H. | ........ | ........ | 2,351 | ........ | 462 | 654 | 188 | ........ | 4,043 | $263 | 2,503 | 70 | 2,351 | 8,113 | 10,464 |
| Vt | ........ | $2,697 | 1,724 | ........ | ........ | 68 | 369 | 26 | 701 | 361 | 409 | 43 | 4,421 | 1,934 | 6,355 |
| Mass. | 5,051 | 19,074 | 36,485 | 16,250 | 4,974 | 7,003 | 4,765 | 2,746 | 51,664 | 46,719 | 58,610 | 16,721 | 60,960 | 192,381 | 253,341 |
| R. I. | 1,201 | 5,977 | 5,228 | 3,646 | 1,050 | 4,544 | 2,684 | 379 | 6,249 | 3,866 | 8,009 | 1,439 | 12,710 | 30,123 | 42,833 |
| Conn. | 14,124 | 47,271 | 12,053 | 4,153 | 1,748 | 4,094 | 2,606 | 555 | 4,650 | 40,308 | 37,102 | 15,783 | 73,636 | 95,028 | 168,664 |
| **New Eng.** | **$20,478** | **$75,019** | **$60,315** | **$26,246** | **$8,445** | **$17,168** | **$12,881** | **$4,255** | **$72,135** | **$91,517** | **$108,719** | **$38,366** | **$156,679** | **$340,499** | **$497,178** |
| Chg '49-'50 | −47% | +47% | +92% | −36% | −12% | +1% | −29% | −46% | +131% | +6% | +83% | +147% | +6% | +40% | +27% |
| % of U. S. | 1.2 | 2.4 | 6.1 | 6.9 | 3.9 | 6.0 | 3.6 | 1.0 | 5.7 | 25.5 | 4.5 | 2.0 | 2.3 | 6.0 | 4.0 |
| Jan. Feb. '51 | $14,806 | $8,276 | $2,528 | $1,327 | $1,713 | $4,107 | $3,489 | $1,107 | $5,045 | $12,054 | $8,613 | $1,843 | $25,610 | $37,455 | **$63,065** |
| Chg '50-'51 | +1022% | −45% | −43% | −53% | +425% | +131% | +348% | +137% | −73% | −1% | −73% | −93% | +23% | −46% | −30% |
| % of U. S. | 1.4 | 2.3 | 2.1 | 1.9 | 5.6 | 7.7 | 7.8 | 2.7 | 3.8 | 9.0 | 2.1 | 0.5 | 1.5 | 4.0 | 2.5 |
| **Backlog*** | | | | | | | | | | | | | | | |
| Dec. '50 | **$105,065** | | **$324,386** | **$350,936** | **$69,519** | **$127,736** | **$139,696** | **$200,353** | **$234,130** | | **$943,175** | **$517,421** | **$563,296** | **$1,931,700** | **$2,494,996** |
| % of U. S. | 1.8 | | 4.7 | 7.1 | 5.0 | 5.9 | 38.0 | 2.8 | 5.1 | | 7.8 | 5.3 | 3.0 | 5.7 | 4.8 |
| Feb '51 | $360,906 | | $345,186 | $419,914 | $68,796 | $125,168 | $146,727 | $200,153 | $231,950 | | $973,730 | $533,755 | $894,997 | $1,977,533 | **$2,972,530** |

* Backlog of engineering construction proposed but not yet put under contract. † Incl. private. § Incl. public.

## Middle Atlantic



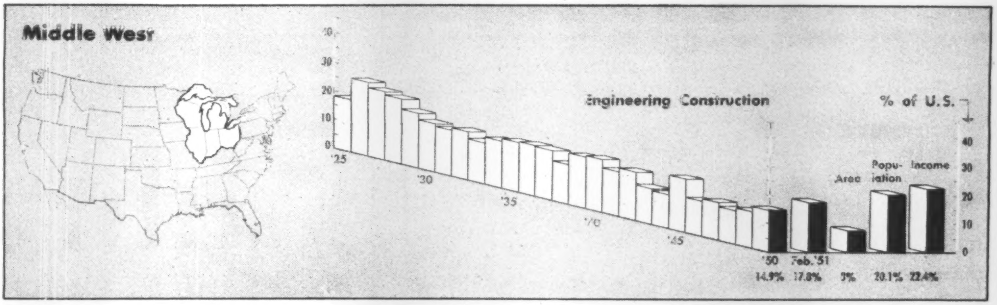
# Contracts awarded and engineering construction backlog* in 1950, also Jan.-Feb., 1951

## as reported by Engineering News-Record and Construction Daily, thousands of dollars, (000 omitted)

### Middle Atlantic contracts

| | Privately financed projects | | | Publicly financed projects | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Industrial Buildings | Commercial buildings Residential | Commercial buildings Other | Unclassified§ | Waterworks | Sewerage | Bridges† | Earthwork Irr.-drain. | Streets, Roads | Buildings Residential | Buildings Other | Federal work | Engineering construction Private | Engineering construction Public | Tota |
| N. Y. | $61,643 | $445,813 | $144,935 | $31,957 | $26,487 | $26,757 | $36,142 | $9,780 | $72,794 | $66,735 | $102,106 | $16,104 | $655,041 | $370,108 | $1,025,149 |
| N. J. | 30,264 | 174,429 | 20,552 | 10,460 | 1,832 | 7,752 | 82,441 | 3,038 | 99,344 | 12,679 | 22,808 | 12,075 | 227,488 | 238,111 | 465,599 |
| Pa. | 120,703 | 320,472 | 104,176 | 29,614 | 17,902 | 20,452 | 30,698 | 8,493 | 142,302 | 19,676 | 88,185 | 27,852 | 549,777 | 352,896 | 902,673 |
| Md. | 15,260 | 62,086 | 16,356 | 11,812 | 7,976 | 9,645 | 11,259 | 918 | 41,299 | 2,541 | 59,697 | 8,092 | 102,732 | 135,917 | 238,649 |
| D. C. | 13,169 | 20,442 | 14,933 | 1,837 | 716 | 909 | 564 | ........ | 2,157 | ........ | 7,003 | 3,739 | 48,544 | 13,186 | 61,730 |
| Del. | 1,776 | 45,738 | 529 | 534 | 582 | 941 | 3,163 | 631 | 5,371 | 461 | 6,381 | 904 | 48,043 | 18,664 | 66,107 |
| **Mid. Atl.** | **$242,815** | **$1,068,980** | **$301,481** | **$86,214** | **$55,495** | **$66,456** | **$164,067** | **$22,860** | **$363,267** | **$102,092** | **$286,180** | **$68,786** | **$1,631,625** | **$1,128,282** | **$2,759,907** |
| Chg '49-'50 | +56% | +68% | +87% | +21% | −8% | −22% | −4% | −50% | +79% | −42% | −6% | −50% | +70% | +2% | +33% |
| % of U. S. | 14.4 | 34.3 | 30.9 | 20.6 | 25.8 | 23.1 | 58.1 | 5.5 | 28.6 | 28.5 | 11.9 | 3.7 | 24.5 | 19.9 | 22.4 |
| Jan-Feb '51 | $357,296 | $88,361 | $19,433 | $12,572 | $2,065 | $6,919 | $3,458 | $772 | $30,598 | $18,792 | $49,306 | $26,197 | $465,184 | $124,388 | $589,572 |
| Chg '50-'51 | +2042% | −44% | −74% | −14% | −92% | +10% | −84% | −78% | −10% | +239% | +41% | +164% | +83% | −13% | +49% |
| % of U. S. | 34.8 | 24.5 | 16.4 | 17.9 | 6.9 | 13.1 | 7.8 | 1.9 | 23.2 | 14.0 | 11.8 | 7.4 | 28.8 | 13.5 | 23.2 |
| **Backlog*** | | | | | | | | | | | | | | | |
| Dec '50 | ***$1,151,969** | | **$1,922,468** | **$2,316,729** | **$444,319** | **$645,103** | **$459,490** | **$352,166** | **$1,782,020** | | **$3,931,752** | **$1,135,624** | **$3,520,232** | **$9,485,784** | **$13,006,016** |
| % of U. S | 20.0 | | 27.6 | 47.7 | 32.1 | 29.6 | 33.2 | 4.9 | 38.8 | | 32.6 | 11.6 | 19.3 | 28.0 | 25.0 |
| Feb '51 | $1,061,228 | | $2,012,667 | $2,341,803 | $444,958 | $664,524 | $464,910 | $372,601 | $1,952,305 | | $3,943,525 | $1,196,954 | $3,521,506 | $9,737,015 | $13,258,521 |

* Backlog of engineering construction proposed but not yet put under contract † Incl. private. § Incl. public.

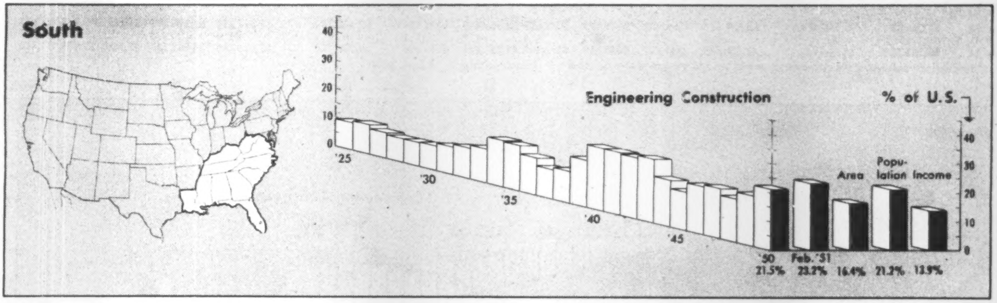


## Contracts awarded and engineering construction backlog* in 1950, also Jan.-Feb., 1951

**Middle West contracts** (Thousands of dollars, 000, omitted)

| | Privately financed projects | | | | Publicly financed projects | | | | | | | | Engineering construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Industrial Buildings | Commercial buildings Residential | Commercial buildings Other | Unclassified§ | Waterworks | Sewerage | Bridges† | Earthwork Irr.-drain. | Streets, Roads | Buildings Residential | Buildings Other | Federal work | Private | Public | Total |
| **Ohio** | $147,420 | $243,636 | $47,169 | $20,904 | $6,593 | $8,236 | $10,401 | $2,704 | $52,610 | $950 | $52,381 | $19,264 | $452,231 | $141,773 | **$594,004** |
| **Ind.** | 104,846 | 21,880 | 13,784 | 14,478 | 2,974 | 7,536 | 6,097 | 1,932 | 16,118 | 2,359 | 19,661 | 6,936 | 150,603 | 61,062 | **211,665** |
| **Ill.** | 151,018 | 171,466 | 58,115 | 98,464 | 5,014 | 14,498 | 8,030 | 8,692 | 26,746 | 9,023 | 73,661 | 33,284 | 467,851 | 156,876 | **624,727** |
| **Wis.** | 41,070 | 15,352 | 26,004 | 6,299 | 2,482 | 8,661 | 3,238 | 1,684 | 25,648 | 9,735 | 22,291 | 3,308 | 82,576 | 79,888 | **162,464** |
| **Mich.** | 112,056 | 31,541 | 14,365 | 6,556 | 7,736 | 11,763 | 5,140 | 1,829 | 15,511 | 9,145 | 36,280 | 8,093 | 161,082 | 90,840 | **251,922** |
| **Mid. West** | **$556,410** | **$483,875** | **$159,437** | **$146,701** | **$24,799** | **$50,694** | **$32,906** | **$16,841** | **$136,633** | **$31,212** | **$205,274** | **$70,885** | **$1,314,343** | **$530,439** | **$1,844,782** |
| **Chg '49-'50** | +167% | +100% | +61% | +109% | +16% | +27% | −12% | −30% | +25% | +36% | +20% | +12% | +118% | +19% | +76% |
| **% of U. S.** | 33.1 | 15.5 | 16.4 | 22.0 | 11.5 | 17.6 | 31.5 | 4.1 | 10.8 | 8.7 | 8.5 | 3.7 | 19.7 | 9.3 | 14.9 |
| **Jan-Feb '51** | $254,755 | $63,750 | $30,915 | $12,511 | $3,432 | $13,459 | $4,663 | $1,310 | $27,334 | $9,981 | $27,869 | $8,758 | $360,443 | $89,536 | **$449,979** |
| **Chg '50-'51** | +326% | −34% | +206% | +54% | −58% | +40% | +251% | +9% | +682% | ........ | +41% | +162% | +112% | +83% | +106% |
| **% of U. S.** | 24.8 | 17.6 | 26.2 | 12.4 | 11.4 | 25.4 | 10.5 | 3.2 | 20.7 | 7.5 | 6.7 | 2.5 | 22.3 | 9.7 | 17.7 |
| **Backlog*** | | | | | | | | | | | | | | | |
| **Dec '50** | **$1,386.513** | **$998,565** | | **$1,349,113** | **$269,078** | **$541,121** | **$484,509** | **$322,258** | **$890,813** | **$2,188,973** | | **$464,100** | **$3,132,513** | **$5,298,430** | **$8,430,943** |
| **% of U. S.** | 24.1 | 14.3 | | 26.5 | 19.4 | 24.8 | 60.3 | 4.4 | 19.4 | 18.2 | | 4.8 | 17.2 | 15.6 | 16.2 |
| **Feb '51** | $1,830,505 | $1,048,151 | | $1,411,821 | $277,239 | $570,619 | $561,905 | $322.278 | $879.513 | $2,276,535 | | $498,116 | $3.684,831 | $5,493,735 | **$9,178,566** |

* Backlog of engineering construction proposed but not yet put under contract. † Incl. private. § Incl. public.

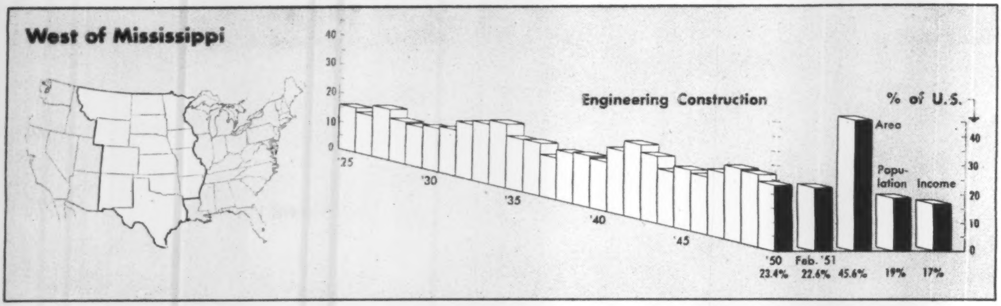


## Contracts awarded and engineering construction backlog* in 1950, also Jan.-Feb., 1951

**South contracts**

| | Privately financed projects | | | | Publicly financed projects | | | | | | | | Engineering construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Industrial Buildings | Commercial buildings Residential | Commercial buildings Other | Unclassified§ | Waterworks | Sewerage | Bridges† | Earthwork Irr.-drain. | Streets, Roads | Buildings Residential | Buildings Other | Federal work | Private | Public | Total |
| **Va.** | $14,946 | $20,978 | $21,651 | $19,498 | $3,413 | $5,843 | $20,720 | $8,042 | $19,256 | $4,669 | $38,107 | $26,554 | $65,241 | $111,882 | $177,123 |
| **W. Va.** | 55,792 | 1,850 | 4,137 | 6,083 | 252 | ........ | 3,162 | 142 | 8,563 | ........ | 7 636 | 1,202 | 66,694 | 20,923 | 87,617 |
| **N. C.** | 62,359 | 38,794 | 14,635 | 8,838 | 2,900 | 1,662 | 9,096 | 743 | 48,644 | 14,262 | 56,443 | 22,002 | 118,793 | 139,583 | 258,376 |
| **S. C.** | 25,273 | 11;521 | 2,173 | 3,969 | 2,220 | 2,137 | 1,894 | 6,020 | 12,466 | 3,033 | 270,581 | 267,485 | 42,108 | 299.179 | 341,287 |
| **Ga.** | 18,831 | 47,531 | 17,815 | 9,386 | 1,724 | 3,144 | 7,123 | 5,215 | 17,543 | 6,150 | 17,880 | 7,589 | 88,190 | 64,152 | 152,342 |
| **Fla.** | 56,283 | 98,443 | 10,873 | 11,528 | 6,504 | 9,485 | 11,207 | 6,662 | 27,061 | 16,336 | 19,772 | 8,739 | 171,940 | 102,214 | 274,154 |
| **Ala.** | 60,921 | 16,723 | 9,793 | 10,211 | 5,273 | 872 | 2,284 | 244 | 15,570 | 9,871 | 14,569 | 5,623 | 90,272 | 56,059 | 146,331 |
| **Miss.** | 6,667 | 11,715 | 2,466 | 38,547 | 1,561 | 3,128 | 2,434 | 7,509 | 9,338 | 1,071 | 10,870 | 14,443 | 47,653 | 47,653 | 95,306 |
| **La.** | 34,989 | 69,179 | 11,100 | 56,157 | 8,895 | 8,163 | 10,286 | 23,611 | 28,308 | 5,193 | 21,106 | 22,883 | 168,727 | 108,290 | 277,017 |
| **Ky.** | 63,680 | 23,138 | 7,360 | 7,028 | 1,021 | 1,211 | 2,828 | 8,906 | 36,312 | 367 | 514,962 | 511,749 | 99,700 | 567,110 | 666,810 |
| **Tenn.** | 24,693 | 29,300 | 13,977 | 17,811 | 2,939 | 2,671 | 7,123 | 13,324 | 22,368 | 14,988 | 32,743 | 45,279 | 80,010 | 101,927 | 181,937 |
| **South.** | **$424,434** | **$369,172** | **$115,980** | **$189,056** | **$36,702** | **$38,316** | **$78,157** | **$90,418** | **$245,429** | **$75,940** | **$1,004,696** | **$933,548** | **$1,039,328** | **$1,619,972** | **$2,658,300** |
| **Chg '49-'50** | +290% | +50% | +38% | +65% | +22% | +38% | +56% | −4% | +42% | +158% | +141% | +148% | +100% | +92% | +95% |
| **% of U. S.** | 25.2 | 11.9 | 11.9 | 31.3 | 17.1 | 13.3 | 60.1 | 19.3 | 19.4 | 21.2 | 41.8 | 49.2 | 15.6 | 28.5 | 21.5 |
| **Jan-Feb '51** | $104,271 | $26,202 | $23,459 | $34,385 | $3,219 | $8,669 | $17,866 | $17,653 | $29,381 | $63,773 | $260,375 | $243,348 | $172,360 | $416,893 | $589,253 |
| **Chg '50-'51** | +626% | −61% | +56% | +216% | −40% | +397% | +158% | +176% | +14% | +750% | +795% | +925% | +70% | +364% | +209% |
| **% of U. S.** | 10.2 | 7.2 | 19.8 | 40.0 | 10.7 | 16.4 | 40.2 | 43.5 | 22.2 | 47.7 | 62.2 | 68.4 | 10.7 | 45.2 | 23.2 |
| **Backlog*** | | | | | | | | | | | | | | | |
| **Dec '50** | ***$871,818** | **$669,484** | | **$1,447** | **$127,964** | **$302,148** | **$182,265** | **$825,945** | **$226,909** | **$1,444,021** | | **$1,420,026** | **$2,327,968** | **$3,570,502** | **$5,898 470** |
| **% of U. S.** | 11.7 | 9.6 | | 27.8 | 9.2 | 13.8 | 21.7 | 11.3 | 4.9 | 12.0 | | 14.6 | 12.8 | 10.6 | 11.3 |
| **Feb '51** | $799,332 | $672,860 | | $1,584,240 | $131,360 | $309,731 | $175,640 | $782,193 | $226,431 | $1,376,536 | | $1,449,406 | $2,506,845 | $3,551,478 | $6,058,323 |

* Backlog of engineering construction proposed but not yet put under contract. † Incl. private. § Incl. public.



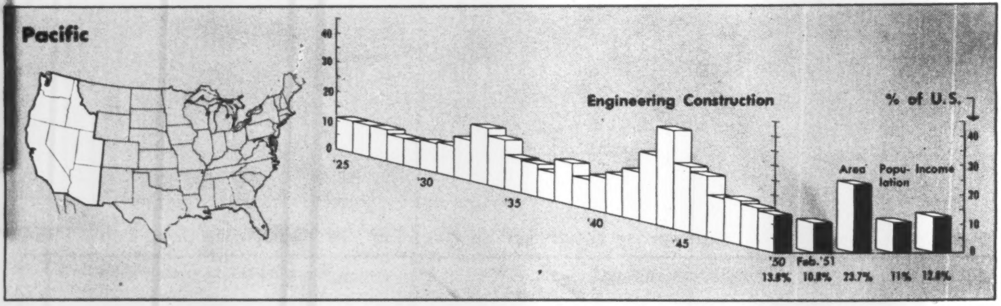
# Contracts awarded and engineering construction backlog* in 1950, also Jan.-Feb., 1951

## West of Mississippi contracts

(Thousands of dollars, 000, omitted)

| | Privately financed projects | | | | Publicly financed projects | | | | | | | | Engineering construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Industrial Buildings | Commercial buildings Residential | Commercial buildings Other | Un-classified§ | Water-works | Sewerage | Bridges† | Earth-work Irr.-drain. | Streets, Roads | Buildings Residential | Buildings Other | Federal work | Private | Public | Total |
| Minn. | $17,532 | $27,794 | $31,795 | $9,388 | $2,100 | $5,572 | $1,797 | $7,398 | $28,874 | $10,819 | $26,689 | $14,645 | $81,852 | $87,906 | $169,758 |
| Iowa | 13,063 | 15,304 | 5,261 | 13,651 | 2,281 | 2,879 | 11,435 | 3,563 | 29,779 | 1,085 | 12,929 | 2,561 | 44,501 | 66,719 | 111,220 |
| Mo. | 48,624 | 77,745 | 39,728 | 105,772 | 1,338 | 2,577 | 3,854 | 8,396 | 17,500 | 525 | 28,328 | 27,693 | 265,588 | 68,794 | 334,382 |
| Ark. | 5,383 | 1,932 | 4,867 | 36,338 | 831 | 1,831 | 1,414 | 20,386 | 14,928 | 5,114 | 40,202 | 57,172 | 46,492 | 86,734 | 133,226 |
| N. D. | 4,710 | 640 | 4,519 | 16,026 | 1,957 | 692 | 896 | 15,316 | 12,856 | 1,343 | 4,706 | 24,772 | 16,396 | 47,265 | 63,661 |
| S. D. | 263 | 6,500 | 1,138 | 9,543 | 426 | 575 | 717 | 13,178 | 7,833 | 354 | 3,732 | 16,934 | 14,390 | 29,869 | 44,259 |
| Neb. | 7,329 | 14,709 | 4,337 | 27,207 | 1,150 | 745 | 6,739 | 11,174 | 12,308 | 693 | 6,843 | 12,993 | 49,466 | 43,768 | 93,234 |
| Kan. | 26,556 | 25,477 | 4,398 | 28,078 | 1,433 | 3,295 | 3,945 | 2,258 | 22,305 | 3,098 | 25,850 | 3,448 | 81,811 | 64,882 | 146,693 |
| Okla. | 16,846 | 5,450 | 7,392 | 44,760 | 8,121 | 4,952 | 6,537 | 2,808 | 38,401 | 3,592 | 26,048 | 20,406 | 69,059 | 95,848 | 164,907 |
| Tex. | 198,418 | 449,711 | 122,628 | 269,357 | 39,640 | 34,308 | 5,240 | 34,919 | 87,384 | 8,499 | 103,006 | 39,154 | 1,022,915 | 330,195 | 1,353,110 |
| Mont. | 300 | 1,450 | 1,731 | 11,425 | 581 | 75 | 1,267 | 9,616 | 11,009 | 1,084 | 7,348 | 15,697 | 11,107 | 34,779 | 45,886 |
| Wyo. | ........ | 5,300 | 1,129 | 22,312 | 717 | 953 | 158 | 3,806 | 8,675 | ........ | 4,492 | 6,428 | 25,731 | 21,811 | 47,542 |
| Colo. | 3,111 | 3,370 | 9,791 | 9,024 | 3,808 | 439 | 1,583 | 9,658 | 10,867 | 1,448 | 9,907 | 16,156 | 21,247 | 41,759 | 63,006 |
| N. M. | 774 | 20,400 | 2,642 | 30,161 | 1,837 | 1,746 | 1,959 | 3,316 | 17,011 | 5,558 | 35,050 | 49,611 | 49,552 | 70,902 | 120,454 |
| **W. of Miss.** | **$342,899** | **$655,792** | **$241,356** | **$633,042** | **$66,215** | **$60,639** | **$47,541** | **$145,792** | **$319,730** | **$43,212** | **$335,130** | **$307,670** | **$1,800,107** | **$1,091,231** | **$2,891,338** |
| **Chg '49-'50** | +32% | +46% | +58% | +71% | +62% | +36% | +4% | −21% | +21% | +2% | +40% | −4% | +58% | +14% | +38% |
| **% of U. S.** | 20.4 | 21.0 | 24.8 | 83.4 | 30.8 | 21.1 | 36.6 | 34.9 | 25.2 | 12.0 | 14.0 | 16.2 | 27.0 | 19.2 | 23.4 |
| **Jan Feb '51** | $238,728 | $111,709 | $36,232 | $54,136 | $15,262 | $12,318 | $9,824 | $7,897 | $26,745 | $20,354 | $39,126 | $37,390 | $420,867 | $151,464 | **$572,331** |
| **Chg '50-'51** | +457% | +18% | +3% | +23% | +115% | +165% | +85% | −51% | −9% | −780% | +21% | +7% | +101% | +45% | +82% |
| **% of U. S.** | 23.3 | 30.9 | 30.7 | 61.4 | 50.7 | 23.2 | 117.3 | 19.5 | 20.2 | 15.2 | 9.3 | 10.5 | 26.1 | 16.4 | 22.6 |
| **Backlog*** | | | | | | | | | | | | | | | |
| **Dec '50** | **$1,881,211** | **$1,646,432** | | **$3,024,321** | **$335,870** | **$341,599** | **$278,859** | **$2,999,675** | **$784,484** | **$2,002,122** | | **$3,315,236** | **$5,926,909** | **$7,367,664** | **$13,294,573** |
| **% of U. S.** | 32.7 | 23.7 | | 57.0 | 24.2 | 15.7 | 35.1 | 41.2 | 17.1 | 16.6 | | 34.0 | 32.5 | 21.8 | 25.5 |
| **Feb '51** | $2,195,523 | $1,606,521 | | $3,330,440 | $341,227 | $335,419 | $288,034 | $3,063,847 | $779,354 | $2,070,788 | | $3,628,289 | $6,262,143 | $7,749,010 | **$14,011,153** |

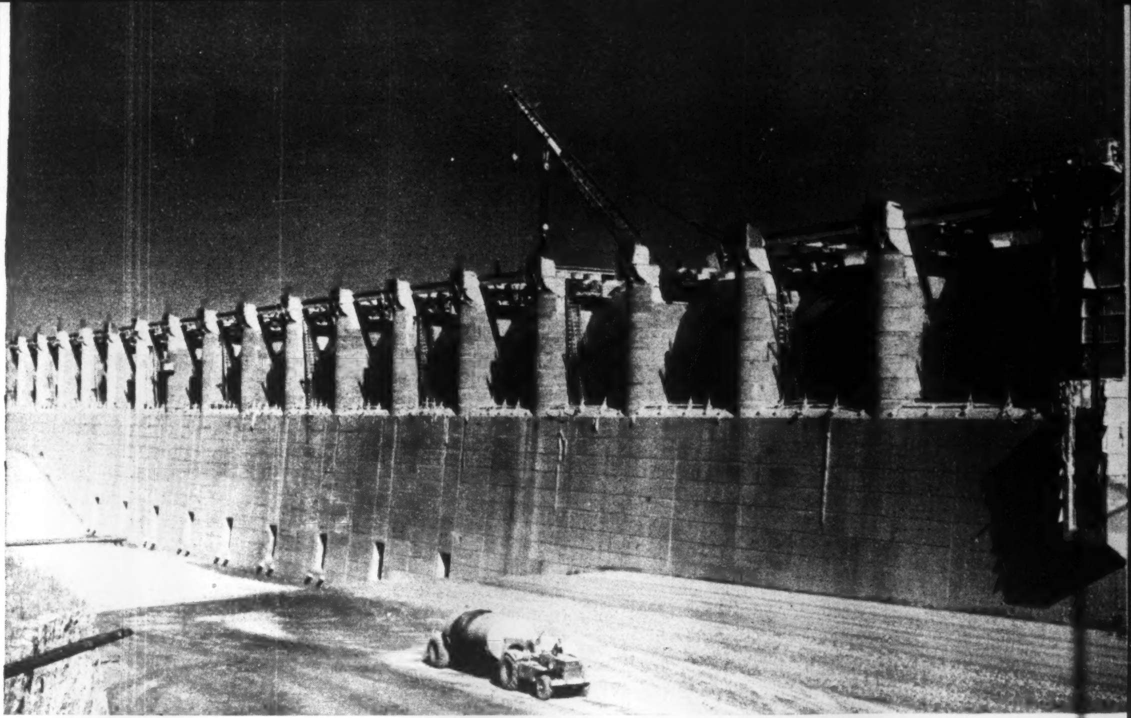
* Backlog of engineering construction proposed but not yet put under contract † Incl. private. § Incl. public.



## Far West contracts

| | Privately financed projects | | | | Publicly financed projects | | | | | | | | Engineering construction | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Industrial Buildings | Commercial buildings Residential | Commercial buildings Other | Un-classified§ | Water-works | Sewerage | Bridges† | Earth-work Irr.-drain. | Streets, Roads | Buildings Residential | Buildings Other | Federal work | Private | Public | Total |
| **Idaho** | $3,774 | $500 | $1,115 | $21,691 | $145 | $438 | $1,076 | $5,039 | $8,173 | $1,131 | $28,748 | $32,758 | $24,497 | $47,333 | **$71,830** |
| **Utah** | 5,211 | 2,000 | 1,741 | 1,923 | 894 | 93 | 363 | 1,260 | 6,754 | 600 | 16,590 | 12,221 | 10,149 | 27,280 | **37,429** |
| **Ariz.** | ........ | 1,741 | 1,721 | 29,416 | 250 | 1,995 | 607 | 6,635 | 7,712 | 585 | 3,986 | 9,856 | 29,737 | 24,911 | **54,648** |
| **Nev.** | 345 | 600 | | 1,734 | 219 | ........ | ........ | 839 | 5,525 | ........ | 276 | 2,275 | 1,945 | 7,593 | **9,538** |
| **Wash.** | 17,981 | 42,308 | 18,500 | 26,758 | 3,401 | 8,530 | 10,708 | 56,548 | 24,434 | 3,750 | 240,646 | 285,111 | 78,731 | 372,833 | **451,564** |
| **Ore.** | 11,850 | 16,784 | 3,306 | 30,328 | 2,476 | 5,941 | 4,087 | 23,691 | 15,137 | 219 | 18,021 | 54,879 | 34,453 | 97,387 | **131,840** |
| **Calif.** | 56,625 | 400,323 | 72,153 | 62,710 | 15,744 | 37,146 | 16,951 | 52,440 | 63,404 | 8,557 | 157,200 | 80,296 | 548,882 | 394,371 | **943,253** |
| **Far West** | **$95,786** | **$464,256** | **$96,536** | **$174,560** | **$23,129** | **$54,143** | **$33,792** | **$146,452** | **$131,139** | **$14,842** | **$465,467** | **$477,396** | **$728,394** | **$971,708** | **$1,700,102** |
| **Chg '49-'50** | −46% | +123% | +119% | +26% | −48% | −14% | +12% | −17% | +11% | +48% | +165% | +77% | +48% | +40% | +43% |
| **% of U. S.** | 5.7 | 14.9 | 9.9 | 35.8 | 10.9 | 18.9 | 10.1 | 35.2 | 10.3 | 4.1 | 19.3 | 25.2 | 10.9 | 17.1 | 13.8 |
| **Jan-Feb '51** | $56,505 | $63,306 | $5,661 | $62,102 | $4,430 | $7,520 | $7,282 | $11,859 | $13,101 | $8,818 | $33,173 | $38,127 | $170,761 | $102,996 | **$273,757** |
| **Chg '50-'51** | +546% | −3% | +32% | +69% | +105% | −30% | +45% | −44% | +24% | +609% | −85% | −84% | +101% | −66% | −30% |
| **% of U. S.** | 5.5 | 17.5 | 4.8 | 66.4 | 14.7 | 14.2 | 16.4 | 29.2 | 9.9 | 6.6 | 7.9 | 10.7 | 10.6 | 11.2 | 10.8 |
| **Backlog*** | | | | | | | | | | | | | | | |
| **Dec '50** | **$556,557** | **$1,401,248** | | **$1,716,763** | **$139,980** | **$224,618** | **$147,298** | **$2,581,338** | **$679,878** | **$1,540,371** | | **$2,901,792** | **$2,779,186** | **$6,208,865** | **$8,988,051** |
| **% of U. S.** | 9.7 | 20.1 | | 33.9 | 10.1 | 10.2 | 11.7 | 35.4 | 14.7 | 12.8 | | 29.7 | 15.2 | 18.3 | 17.2 |
| **Feb '51** | $602,035 | $1,439,021 | | $1,779,425 | $139,804 | $220,203 | $152,812 | $2,595,544 | $679,792 | $1,650,934 | | $4,002,057 | $2,868,871 | $6,390,699 | **$9,259,570** |

* Backlog of engineering construction proposed but not yet put under contract. † Incl. private. § Incl. public.



EIGHTEEN GREAT GATES, designed to discharge nearly half a million cubic feet of water every second when fully opened, control the spillway of Harlan County Dam on the Republican River in Nebraska. Closure will be made later this year.

# Trends and Techniques

## An editorial survey of development in the many fields of interest of civil engineers, architects and construction men

**1950** was a busy and prosperous year for civil engineering and the construction industry. From a dollar viewpoint it was the largest construction year in history. Contracts for civil-engineering construction totaled $12.35 billion as compared to the 1949 record of $8.16 billion.

Details of that spectacular record will be found elsewhere in this issue. In studying that record, however, it should be realized that the dollar total, when converted into tons of steel put in place and yards of concrete, would not be so impressive when set off against like figures for the years immediately preceding World War II. That is due to a continuing rise in construction cost.

Another factor that cannot be overlooked is the effect of stepping up the defense program, following the outbreak of war in Korea. For example, just as the year was closing the Atomic Energy Commission let contracts totaling $750 million. Though credited to 1950, that very large block of work will be done this year or next.

Much of the continued high volume of industrial construction can also be credited to the huge defense program. These gains more than offset the decline in the housing boom that occurred in the latter part of the year as a result of tighter credit restrictions put on at that time.

Industrial construction tied closely to the defense effort can be expected to keep the volume of new construction high in 1951. The record to date this year is far ahead of the record for the same period last year. Public housing also is far above last year's figure, and private house construction is down, as was to be expected. Restrictions on commercial building and on all types of amusement and sports facilities also are showing their effect.

Noteworthy in the current industrial expansion is the large amount of new plant capacity for production of steel and aluminum announced around the first of the year. Most of this expansion is the direct result of the nation's greatly expanded defense program, but part is in no way related to it, being simply the result of the country's growth.

In view of the large combined capacity of the new steel plants being built by the principal steel producers, it appears probable that some of the new plants proposed by new companies or by small producers, for which federal loans are sought, will not be built. The possibility that this great expansion may result in an excess of capacity already is causing large steel producers some concern.

Of more than passing interest to the construction industry is the possibility that this great expansion of steel capacity could materially shorten the period in which construction requiring steel must be restricted.

At the close of 1950 the statistical staff of this journal estimated that new construction put in place in 1951 would be 17½% below 1950. They estimated that all private construction except industrial work would decline sharply; that there would be small gains in normal types of public construction, in public utilities and roads, larger increases in private industrial, warehouse and farm buildings, and very large increases in military facilities. It appears now that these estimates were too conservative.

• **Labor requirements spotty**—Construction labor was scarce throughout all of 1950. That condition continued into the early part of this year, but unemployment is beginning to develop in some of the larger cities where the building trades are employed largely on commercial construction. In areas where defense construction is active, construction labor is more scarce than last year. It may become critical before the year is out.

• **Engineers in demand**—As 1950 opened, the market for engineers was so slow that the Bureau of Labor Statistics, seeing the unprecedented size of the graduating classes in engineering schools, issued a gloomy prediction that there would be a considerable surplus of engineers before the year was out.

That brought a shower of criticism from the heads of most of those schools, who had been studying their declining admission records and the decline of interest in engineering as a career among high-school students. This latter study had convinced them that there would not be enough engineers to meet normal demands during the next few years unless some way could be found to step up enrollments.

A spot check of the requirements of industrial companies for engineers, made early in 1950 by the Manpower Commission of Engineers' Joint Council, showed a small decline in the number of job opportunities, thus confirming the Labor Department's prediction.

But that was before the attack on South Korea set off a rapid expansion of this country's defense planning. Before the year was out the 47,000 young graduates had all been absorbed and the help-wanted sections of big metropolitan dailies were full of advertisements for engineers, largely in the aeronautical industries.

In September the director of the Manpower Office of the National Security Resources Board asked the EJC Manpower Commission for a report on the situation with respect to engineers. The commission reported late in December that it had determined that by 1954 there will be a cumulative shortage of over 40,000 engineering graduates. It urged that every effort be made to increase the enrollment in engineering schools, that the schools be operated on a full-time schedule, and that induction into military service of students making a satisfactory record be postponed.

Registration of every man under 70 years of age holding a bachelor's degree in engineering and all students of engineering was recommended, also the establishment of a National Engineering Personnel Board to classify the registrants and make selections to meet military and industrial requirements. Revival of the Engineering, Science, Management War Training Program of the last war also was proposed.

The findings of the EJC Manpower Commission as to the inadequate number of young men now in engineering schools served to confirm the findings of engineering educators as to the need for a larger flow of potential engineers into the engineering schools during the coming years if the normal demands of industry are to be met.

It appears probable now that the abnormal requirements of this year and the next year or two will have to be met as they were during the early years of World War II, by retaining older men past normal years of retirement, by upgrading men in jobs that can be filled by men of lesser training and by the use of more women for subprofessional jobs usually filled by young graduates.

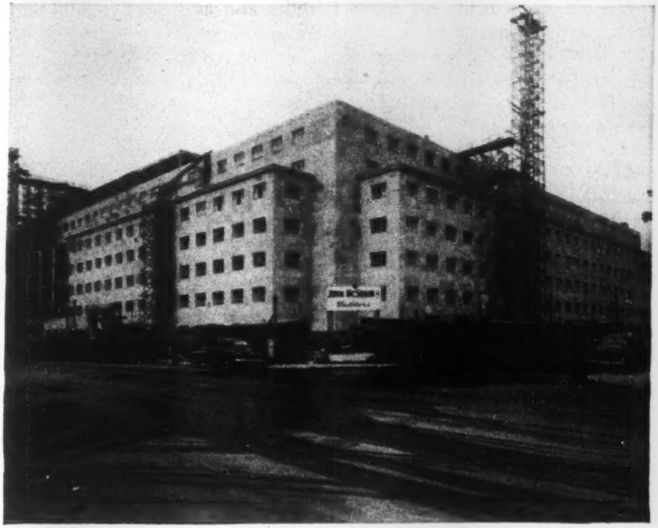
As this is written it is not known what is to be done about drafting or deferring engineering students or what the government will do to keep up the badly needed flow of young men through the engineering schools.

• **Science Foundation**—One of the hard lessons that this country learned early in World War II was that it had not given enough attention to basic research. Most of its research was along the lines of applied sciences. To correct that situation, federal legislation

## PROGRESS ON MAJOR PROJECTS

**Reports of progress made during 1950 on the major civil engineering projects under way in this country, many of which are mentioned in this section, will be found beginning on page 170.**

**LATEST ADDITION to Washington's imposing structures to house federal departments is the new building for the General Accounting Office. The building has 2,000,000 sq. ft. of floor area on which a saving was claimed by flat-slab construction. Cost was $12.50 per sq. ft. A maintenance cost saving is built into the windows—they can be washed from inside.**



calling for creation of a National Science Foundation was introduced in Congress soon after the war. It ran into many difficulties that need not be recounted here and did not pass until last year.

The legislation finally approved set up a National Science Foundation headed by a director to be appointed by the President and a 24-man National Science Board. It anticipates that after the new organization gets on an operating basis Congress will appropriate $15,000,000 a year with which the foundation can finance basic research in colleges and other laboratories and can pay scholarships for students showing aptitudes for research work. For the current year, Congress has only appropriated $225,000 for the foundations organizing activities.

## BUILDINGS AND HOUSING

FOR THE BUILDING INDUSTRY in general, 1950 was an exceptionally prosperous year. Nevertheless, for many, 1951 may be even better.

The amount of construction that can be started this year depends on the extent to which available materials and manpower can be stretched. This, in turn, depends on how much designers and builders can save by exercising ingenuity in design and construction, by using substitute materials and by taking advantage of the latest technological improvements. Building codes, too, are an important factor: Unreasonable requirements for thicknesses of materials and unnecessarily low allowable unit stresses force designers and builders to waste material. And labor unions also play an important role; they sometimes make it necessary for builders to be extravagant with both materials and manpower.

In the best interests of the nation and of the building industry, every effort must be exerted to conserve our resources. A start was made in 1950—with a stepup in research, introduction of better building products and development of faster construction methods. Much remains to be done.

- **Housing makes history**—In 1925, homebuilders put up 937,000 housing units. Then came a depression and World War II. Annual housing production dropped. In 1944, only 141,800 units were built. After the war, the federal government tried in many ways to stimulate home construction. One technique proved successful —government-guaranteed loans, making it easier for builders and purchasers, especially veterans, to borrow money. As a result, the 1925 record was topped in 1949, when 1,025,100 units were started, establishing a new high mark. But last year, even this new record was beaten. Final figure was 1,397,100 units.

The low-rent public housing program, in contrast, made little progress last year. Total starts for 1950 came to 32,000 units. Less than 4,000 were started during the first half of the year, and after the outbreak of the Korean War, President Truman directed that public housing starts for the second half be limited to 30,000. His budget message for fiscal 1952, however, forecast 75,000 starts, these units to be rented preferably to defense workers and personnel of the armed services.

Nearly all the houses built in 1950 were constructed by more or less conventional methods. Prefabricators turned out only 55,000 units. This, however, represented a considerable improvement over previous years (35,000 in 1949; 30,000 in 1948; 37,400 in 1947). As for 1951, the Prefabricated Home Manufacturers' Institute predicts that prefabricators will double their output.

**ANOTHER HOSPITAL** for the Veteran's Administration nears completion. This one is at Shreveport, La. It is now in service, providing 450 beds for general medicinal and surgical cases. The VA had built 27 hospitals by the end of 1950 and had 31 others still under construction.

• **Slum clearance progresses**—While all these new homes were being built, many communities endeavored to rid themselves of slums and blighted areas. By the end of the year, 222 cities and counties had taken steps to qualify for participation in the slum-clearance and redevelopment program under Title I of the Housing Act of 1949. They received capital-grant reservations totaling $172,896,000. Of these localities, 71 obtained Housing and Home Finance Agency approval of planning advances amounting to $3,065,000, and 41 obtained prior approval of expenditures of local funds that may later be included in the total project cost.

Plans now being completed indicate that a wide range of redevelopment is contemplated. General emphasis, though, is on private enterprise redevelopment. Projects involve housing, community facilities, public buildings and improvements, and needed industrial and commercial expansion.

Available for the program is a total authorization of $500 million for capital grants and $1 billion in loans outstanding at any time.

• **Controls stall commercial building**—Like housing, commercial building experienced a prosperous year, despite material shortages and government restrictions. Until the last quarter of the year, it looked as though 1950 might double the previous record for dollar volume of new construction in any one year. But in October, the National Production Authority began issuing regulations—intended to reserve materials for the defense program—that cut into commercial work. Commercial building finished the year 70% ahead of 1949, the previous best year.

Further regulations have intensified gloomy prospects for commercial building in 1951.

• **Industrial building booms**—In contrast, industrial building started slowly in 1950 and zoomed up in the second half of the year. Biggest monthly totals were reported for the three months after housing controls went into effect. By the year's end, a new record had been set for dollar volume of construction.

This tremendous upswing in industrial building has continued into 1951 and shows no signs yet of slowing. At the rate new contracts were announced in January and February, the new record for industrial building, set in 1950, will topple by the end of March.

• **Public building increases**—Dollar volume of public building construction in 1950 was below only that of 1941 and 1942, when the government was building war plants. A large share of the new construction went for atomic energy. Hospitals and schools also boomed.

The Veterans Administration, at the end of 1950, had completed 27 hospitals, providing 14,233 beds, as well as 35 additions, with 12,200 beds. Still under construction were 31 hospitals, with 16,955 beds, and 4 additions, with 1,510 beds. Now in the planning stage are facilities for 7,252 more beds in eight hospitals and 700 beds in two additions.

For the fiscal year 1951 (which ends June 30), the VA has $160 million for hospital construction. The President, in his 1952 budget message in January, asked for $155.2 million for continuing the program. Congress is expected to oblige.

Construction of nonfederal hospitals also was of considerable magnitude last year, but it hardly began to meet community needs. Studies made by state agencies under the Hospital Survey and Construction program indicate that at the beginning of 1950 the supply of acceptable nonfederal hospital beds met only about half the country's needs.

Under the U. S. Public Health Service program last year, 366 hospitals, costing $142.6 million, were completed; 840, costing $691.7 million, are still under construction; and by Dec. 31, 283 more, which will cost $207.7 million, had received initial approval. The government will contribute $385 million to this $1 billion program.

A severe shortage still exists in educational plants, too. The School Housing Section of the U. S. Office of Education, estimates that $20 billion worth of facilities is needed in the next ten years. About $15 billion of this is required for elementary and secondary schools.

To find out how badly schools are overcrowded and to alleviate such conditions where federal activities are responsible, Congress last September passed Public Law 815. Under Title I, $3,000,000 was authorized to assist the states to inventory existing school facilities, to survey the need for construction of additional facilities in relation to the distribution of school population, to develop state plans for school construction programs, and to study the adequacy of state and local resources for meeting school-plant requirements. Under Title II, construction of critically needed schools was authorized for areas that are overcrowded because of federal activities. Results of the state surveys are not yet available.

• **Atomic-energy developments**—Congress also appropriated huge sums for atomic-energy development (well over $1 billion) last year. The money went into construction of plants for producing fissionable materials, chemical processing plants, nuclear reactors of various types, facilities for testing atomic bombs and plants for making atomic bombs, as well as replacement of temporary facilities by more permanent ones. Another outstanding development was the approval given by the Atomic Energy Commission to private institutions to build and operate low-power nuclear reactors for research or educational purposes.

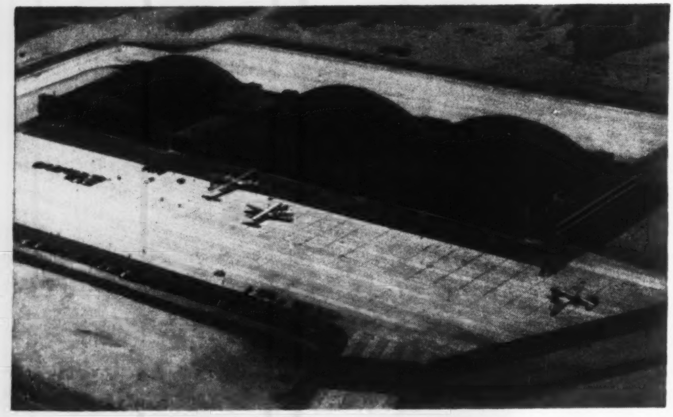
Part of the expansion of production facilities is due to a new product—the hydrogen fusion bomb. The Savannah River project in South Carolina, announced last November, for example, undoubtedly is closely related to the proposed production of hydrogen bombs. Also, a fairly large percentage of the expansion is due to improvements in the A-bomb, apparently aimed at production of smaller bombs. This development is probably related to the move of the AEC to take over part of the 5,000-sq mi Las Vegas, Nev., bombing and gunnery range for experiments with atomic weapons.

Construction was advanced on the experimental breeder reactor at Arco, Idaho. This reactor will test the feasibility of creating new nuclear fuel faster than it is consumed and will produce a small amount of power for experimental purposes. Also, construction was started on a materials-testing reactor and a land-based prototype submarine thermal reactor.

At Oak Ridge, scientists began to assemble a small pilot homogeneous reactor—a new type—in a long-range program to develop fluidized reactors, in which fuel and moderator are mixed in a liquid. All other reactors, except the Los Alamos water boiler, are heterogeneous; i.e., fuel and moderator are separate, and in most reactors, both are solids.

• **The bomb-shelter question**—The role that atomic energy can play as a destructive agency came to the fore last year, as the international situation deteriorated. The possibility of cities on the American continent being attacked from the air loomed larger than ever before. How to construct buildings to resist the A-bomb and how to protect the public were baffling questions that had all levels of government officials worried. As a result, the Atomic Energy Commission

**ON NEW YORK'S LOWER EAST SIDE** a slum clearance project named for city's most famous Eastsider—Alfred E. Smith—is nearing completion. The seven buildings of this first unit, located just north of Brooklyn Bridge, will accommodate 11,455 families. Nearer to the Manhattan Bridge (in foreground) is an earlier slum-clearance project (two blocks from the waterfront). It is Knickerbocker Village, one of the first limited dividend projects built with federal aid in the early '30's. (Thomas Airviews)



**THREE GREAT STEEL HANGARS** have been completed at the New York International Airport. Competition between steel and cement producers for the distinction of having their product used for the frames of those structures proved profitable to the Port Authority. The three 300 x 219-ft. buildings were completed at a cost of $9,000,000.

released considerable data on the effects of an A-bomb, which can serve as a guide in civil defense.

Using this information, Harry L. Bowman, professor of structural engineering at Drexel Institute and consultant to the AEC, advanced several valuable suggestions (ENR Jan. 26, 1950, p 24): Structural frames should be designed for lateral forces, as in earthquake-resistant construction. They should be so proportioned that should any main member be cut, no other main member would fail as a consequence, though stresses might reach, or slightly exceed the yield point.

Protection of urban populations also was studied. Some city officials proposed construction of large public shelters that would serve a useful purpose in peacetime. The catch was that municipalities had little money available for such construction; they looked to the federal government for financing. However, though Congress passed a $3.1 billion civil defense bill under which direct federal aid may be given to communities on a 50-50 basis for bomb shelters that will not pay for themselves through dual use, the lawmakers have been unwilling to open the Treasury's pursestrings for such dual-purpose structures.

A study of the plans proposed by city officials made it clear that only a relatively few people could be accommodated in the temporary underground garages and rapid-transit tunnels being considered. Furthermore, even if the shelters were made large enough to accommodate everyone, few people would get a chance to use them. In the short time available after the first warning of an impending air attack, it would be impossible to empty large office or apartment buildings and transport tenants to the proposed garages and subways.

A more logical solution seems to be construction of bomb shelters in every building—and in the larger ones on every floor. These would have to be built by the owners with private funds.

Despite available information, however, bomb protection generally has not been incorporated in new construction. Apparently, owners are willing to take a chance on war being averted. In some recent cases, prospective owners have turned to the federal government for reimbursement for the additional cost of built-in bomb-proof spaces; but such funds have not yet been authorized by Congress. As a result, a new trend—toward bomb-resistant buildings—failed to materialize. Design and construction trends that existed in 1949 continued through 1950.

• **Trends in building**—Again an increase was registered in the use of panel construction, precast concrete, and lightweight aggregates for concrete and plaster. In addition more new office and factory buildings than in any previous year were air conditioned, higher standards of lighting were observed, and more power lines were incorporated with possible future requirements in mind.

House construction was speeded up, mainly through more wide-scale adoption of on-site mass-production methods and labor-saving devices.

Rising labor and material costs acted as a strong incentive to builders to use or develop new building materials and methods. As a result, use of powered buggies, fork-lift trucks and palletized loads on building jobs increased.

Rising costs also favored continuation of the trend, for certain types of plants, toward buildings that are not enclosed on the sides. Many of the newer duPont chemical plants, for example, are of this open type of construction. It appears to be of advantage where climate permits, where an explosion or fire hazard exists due to the nature of the product being handled, or where relatively few operators are required and the equipment going into the structure is enclosed by protective housing.

The search for more economical methods of construction also led last year to a large-scale trial of an erection method in which large precast slabs for floors and roof of a multistory structure are cast on the ground and jacked to the proper elevation. First to be built by this system was a two-story building at Trinity University, San Antonio, Texas. Floor and roof sections weighing 168 tons each were raised by jacks installed on top of the steel columns. Savings over conventional methods of construction are reported to be at least $0.54 per sq ft of floor area.

Another interesting development—one that undoubtedly will increase in significance in the next few years—was the use of high-tensile steel bolts for permanent connections in the steel frame of an office building in Keene, N. H. Nuts on ⅞-in. bolts were tightened to put a 32,400-psi tension in the bolts. Impact wrenches turned the nuts; torque wrenches finished the job. Advantages claimed over rivets include: tight joints, connection economy and noise reduction.

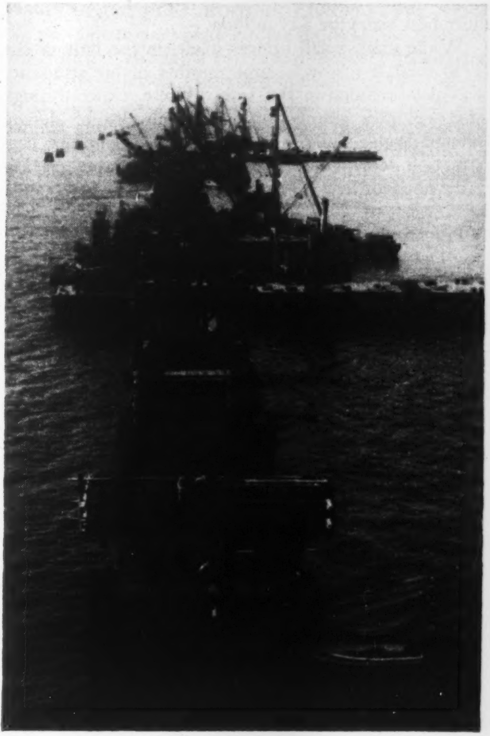
Still another important development last year, aimed at better and more economical building, was the conversion by reinforcing-bar fabricators from older types of deformed bars to bars meeting American Society for Testing Materials Specification A305, "Minimum Requirements of the Deformations of Deformed Steel Bars for Concrete Reinforcement." Higher bond stresses were approved for these bars last month by the American Concrete Institute. Hooks will generally not be needed when these bars are used.

In line with a revision of A305 approved by ASTM, the bars will no longer be specified by their nominal diameters but by a number. This number is equivalent to the number of eighths of an inch included in the nominal diameter.

• **Many research projects started**—Further progress toward better and more economical construction will be made in the next few years as some of the research programs commenced in 1950 get further along. Among the most comprehensive of these programs is that of the Housing and Home Finance Agency.

HHFA last year contracted with various organizations for the performance of specific research: With the University of Illinois for study of use of space for multiple purposes; with the Weather Bureau for determination of more rational snow loads; with the Forest Products Laboratory for re-evaluation of structural requirements. Under a contract with HHFA, the Southwest Research Institute is trying to develop combined concrete floor slabs and foundations for unusual soil conditions that are largely found in the Southwest. The University of Pennsylvania is studying condensation control. And Massachusetts Institute of Technology is comparing relative advantages of various types and sizes of building organizations.

Having found that wood roof trusses have many advantages over wood joist construction, HHFA is now sponsoring a project to develop a rigid-frame roof to make possible greater utilization of the second floor of a 1½-story house. Another recent research finding is that diagonally applied sheathing can be spaced at 2-ft intervals rather than edge to edge and still give adequate racking strength to a wood-frame house.



**PIERS RISE ABOVE CHESAPEAKE BAY for a new bridge being built at a cost of $44,000,000 to provide a new route to Washington east of the present congested highway through Baltimore. It also will permit traffic to by-pass Washington. Crossing over 4 mi of open water, the structure will have 123 spans ranging in length from 60 to 1,600 ft —the longest being a suspension span.**

HHFA estimates that for a typical 1,000-sq ft, one-story dwelling, 80% of the wall sheathing could be saved, or about 1,000 fbm. In addition there would be a saving of 35 lb of nails.

Tests at the National Bureau of Standards, sponsored by HHFA, contributed substantially to the new National Plumbing Code. These tests and more recent findings by HHFA show that metal, money and manpower can be saved in plumbing systems without affecting adequacy of design. Currently, HHFA is investigating non-metallic materials as alternatives for piping, stacks, vents and drains in household plumbing systems to determine whether non-metallic materials can be substituted for critical materials.

Last year also, the newly organized Building Research Advisory Board began to correlate research. In January it held a conference on "Weather and the Building Industry", in June it undertook a survey of housing research being conducted by various organizations throughout the country, and in November it sponsored a conference on the fire resistance of exterior non-bearing walls.

## BRIDGE BUILDING

To SAY THAT 1950 also was a good year for bridge builders would be a gross understatement. It was the best year on record. The $370 million spent for bridge construction topped 1949 expenditures, (the next best year) by $23 million.

While many small bridges made up the bulk of the 1950 total, a relatively large number of big structures was also included in this sum. These, either through size, complex site conditions or novelty of design, offered bridge builders opportunities to improve construction techniques. Foundation jobs were particularly noteworthy.

- **Progress in foundation construction**—In constructing the Delaware River Bridge near Wilmington, Del., for example, it was necessary to use the largest caissons ever built. Plan dimensions of one, 95x221 ft, are bigger even than the 92x197-ft caisson used for the great central anchorage of the Bay Bridge at San Francisco. Forming the west anchorage of a 2,150-ft suspension span—world's sixth longest—the new caisson is, however, only 106 ft high, as compared with the 220 ft at San Francisco. Also the 20-ft water depth in the Delaware is small compared with the 70 ft at the Bay Bridge anchorage.

Another record-breaking feature of the Delaware River Bridge construction was the 99x225-ft cofferdam for the east anchorage. Dredged to El-70, it was sealed with a continuous placement of 26,700 cu yd of concrete, the largest ever made. That concreting operation took 7.4 days.

For sheer magnitude and extent of marine construction operations, the Chesapeake Bay Bridge, just north of Annapolis, Md., will be difficult to equal. Costing $41,000,000, it will be 21,286 ft long, including a 1,600-ft suspension span, a 780-ft through cantilever truss and a long series of deck cantilever trusses. It will provide a shipping clearance of 186.5 ft at the suspension span. Principal interest centers in the 28 piers, which consist of four bell-bottomed cylindrical legs joined by diaphragms. These caissons were set on steel H piles, some of which were driven as much as 135 ft into the bay bottom.

To drive the piles until their tops were under as much as 60 ft of water required some of the heaviest pile hammers in existence. One of these was a 16-ton giant with a 7-ton ram.

An unusual technique was applied in setting batter piles for the Chesapeake bridge. One of the contractors used a gyro-compass to verify pile inclination.

Another outstanding substructure job was carried out for the George P. Coleman Memorial Bridge over the York River at Yorktown, Va. Depth of caissons in water—as much as 80 ft—was exceeded only by the depth of one of the piers at San Francisco. Six caissons were required. One was 110 ft high—tallest ever prefabricated. It was sunk not only through 80 ft of water but also 70 ft farther into the river bottom. None of the other five caissons was less than 95 ft high.

**SPANNING THE DELAWARE** below Wilmington, the country's 6th longest suspension bridge will serve the southern end of New Jersey's toll turnpike, that is to go into service late in 1951. The bridge, scheduled to be opened in July, is a $34,300,000 project to carry four lanes of traffic.

**A STEEL ARCH** of 420-ft span will carry the new by-pass highway around Boston over the Annisquam River at Gloucester, Mass.

To meet strict anchoring and sinking control requirements, the contractors built a "dock" of welded steel pipe framework into which the caissons could be floated and sunk. Four pipe towers, each 112 ft high, held in position by 150-ft long spuds driven through the corner columns, formed the dock.

The two largest caissons of the York River bridge support pivot piers for twin 500-ft swing spans, which are the main feature of the 3,750-ft long superstructure.

Still another unusual foundation job was the one in northern Idaho for the Blue Creek Bay crossing over an arm of Coeur d'Alene Lake. The 1,300-ft long structure is supported on seven towers that range in height up to more than 300 ft. As much as 200 ft of this height is below mud line and much of the rest is below the water line. Below the mud line, each tower consists of four 18-in. dia concrete-filled cylinders arranged in a 30-ft square. There is no lateral support other than the mud between the cylinders.

• **Long-span structures**—In addition to the big bridges previously mentioned, there were several other noteworthy structures under way in 1950.

Tacoma Narrows again was bridged. Replacing a structure that collapsed Nov. 7, 1940, starting extensive studies into the aerodynamics of bridges, the bridge has a center span of 2,800 ft. third longest in the world.

Cable spinning at Tacoma Narrows was somewhat different from that used for its predecessor. Wire was fed from one anchorage, the spinning wheels making the return trip empty. To make up for the resultant loss in production, double wheels were used. Thus, four wires were laid in one cable instead of two wires in both cables on each trip of the wheels. Chief advantage of this setup was a saving in installed equipment.

Construction was also under way in 1950 on three bridges that will contain record-breaking plate-girder spans. One is a four-span pedestrian bridge over the Harlem River in New York City that incorporates the world's longest girder lift span. Erected in Jan., 1951, the two silicon-steel plate girders forming this span are 312 ft long. The other two record-breaking bridges are on the New Jersey Turnpike—one crosses the Passaic River, the second the Hackensack River. Both will contain girders 375 ft long, setting a new U. S. record for continuous-girder spans. (Bonn-Beuel Bridge over the Rhine in Germany, completed in 1949, is reported to have a 643-ft span and another bridge over the Rhine at Cologne, a 605-ft span.)

• **An aluminum arch bridge**—In Canada, the world's first arch bridge of aluminum was completed last year. Spanning 290 ft over the Saguenay River, near Arvida, Quebec, the arch weighs only 200 tons, as compared with the 400 tons that the span would weigh if designed in steel. Erection of the ribs took only two weeks, the long, lightweight sections being placed from a cableway.

A new type of rivet head was developed for the gun-driven aluminum rivets used in this aluminum bridge. They have a manufactured "annular" head that is a modification of the usual button type. At the other end of the rivet shank is a $\frac{3}{16}$-in. dia hole $\frac{3}{8}$-in. deep. In cold driving the rivets, a nipple on the rivet snap engaged the hole, facilitating spread of the metal to form a head.

• **Bridges of prestressed concrete**—Last but not least among the noteworthy bridge jobs under way last year were two prestressed concrete structures. One—a highway bridge in Madison County, Tenn.—was the first to be completed in the U. S. It consists of a cast-in-place concrete deck carried on beams 20 and 30 ft long. Placed side by side, these beams were made of precast concrete blocks compressed to form a monolithic unit by tensioning 7-wire galvanized strands. Prestressing took only three days, and the bridge was opened to traffic in less than two weeks after erection started. Savings of from 40 to 50 c per sq ft over conventional types of short-span bridges were reported.

The second prestressed bridge—the Walnut Lane Bridge in Philadelphia, Pa., which was completed early in 1951—consists of a cast-in-place concrete deck, thirteen 160-ft main-span precast girders, and fourteen 74-ft precast girders in two approach spans. Prestressing was done by the Magnel method, the cables being composed of from 24 to 64 wires 0.276 in. in diameter. In this method only two wires are tensioned at a time, the jacks applying the prestress reacting against the ends of the precast girders.

These developments have opened the way for more widespread use of prestressed concrete. A third bridge is now under construction in California. More bridges will undoubtedly follow as contractors become familiar with prestressing techniques.

Two proposed prestressing jobs in New York City, for example, were dropped last year when bids exceeded the engineer's estimate. There is also a possibility that lack of experience of bridge designers with prestressing is something of a handicap, too. One danger is carrying over of reinforced concrete practices to this new field, which involves considerably different design techniques. Another danger is an inclination toward over-conservatism. Still another is a tendency to use methods that have proved successful in Europe, despite the fact that material and labor conditions abroad are much different from those here.

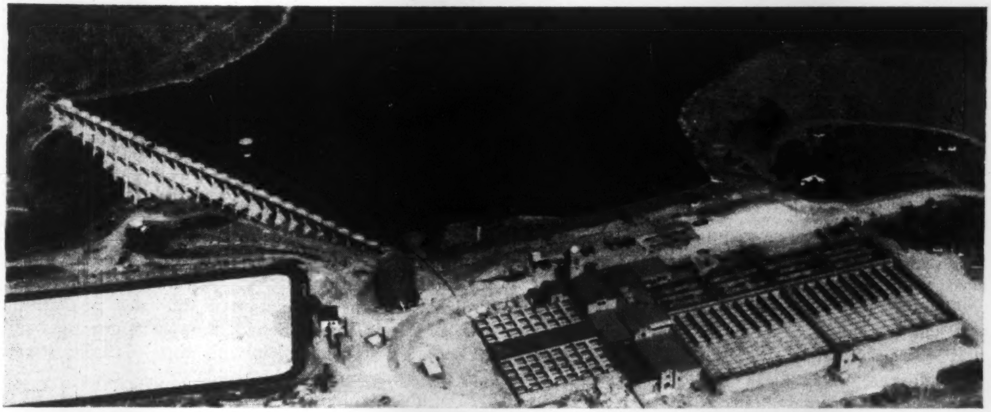
Prospects for bridge building this year are uncertain because of shortages of materials. Mobilization Director Wilson has already stated that steel will not be available for the projected Hudson River crossing of the New York State Thruway until the nation's steel capacity has been increased. It is expected, however, that steel will be provided for bridges on which construction has been started and for structures on approved highway and railway projects.

- **Progress in use of new techniques**—Growth was registered in 1950 in applications of precasting, welding and bolting to bridge construction. Many highway departments apparently were finding that, for small spans, precast concrete is advantageous, considering modern highway loadings, speed of construction, first cost and maintenance. In Pennsylvania, for example, precasting is being used extensively. This trend will probably be accelerated by shortages of structural steel.

The number of welded bridges also continued to increase steadily. More designers are becoming convinced that, for certain types of bridges, welding has an advantage over riveting in facilitating the work, decreasing ultimate cost of the structure, and conserving steel. The latter factor is of utmost significance as steel shortages increase. States notable for their adoption of welded highway bridges include: South Dakota, which has been using welded bridges exclusively since 1945—the year it erected its last riveted truss; Kansas, which built its first all-welded bridge last year—a four-span, deck-girder structure 384 ft long; and Connecticut, Texas, New York and Washington, to name a few. Contractors are becoming more familiar with the requirements of field welding; while fabricators who are equipped to handle such work are showing more willingness to tackle shop welding also.

One of the most promising developments in bridge construction today lies in the use of high-tensile strength bolts. Tests and actual field trials indicate that bolts given a high initial tension produce tighter joints than rivets and are more economical.

**THREE LEVEL INTERCHANGE** at northerly end of the Harbor Drive Expressway in Portland, Oregon. Existing lift bridge on the right spans the Willamette River and carries auto travel on the upper deck and rail traffic on the lower. The 3.36-mi. expressway is due for completion by the end of this year. Completed cost, exclusive of rights of way, will be $7,825,000.



TREATED WATER for San Diego, Calif., started flowing from the 66-mgd Alvarado softening and filtration plant (lower right) early in 1951. A covered reservoir of 20-mg capacity is at lower left. Murray Reservoir in background is not yet tied into the plant, its raw supply coming by pipe and tunnel from San Vicente Reservoir of the San Diego Aqueduct.

# WATER SUPPLY, SANITATION

MORE DOLLARS went into water and sewage-works projects during 1950 than in any other year in history. Record expenditures were $215 million for waterworks and $287 million for sewerage. And despite these record dollar expenditures the backlogs grew—to $1.4 billion for waterworks, $2.2 billion for sewage works.

At 1950's rate of doing the work, there was about seven years of planned construction ahead.

• **Strained water supplies**—When—during 1950—waterworks men were not worrying about where to get materials, many were worrying over where to get water. It was truly a year in which water suppliers were making news, and history, with their efforts and ideas for meeting the ever-growing demand.

The serious water supply situations that developed throughout the nation were partly caused by droughts, mostly caused by increased use—municipal, industrial and agricultural. Supply simply had not kept pace with demand. War had halted construction of water supplies while stimulating growth of water-consuming industries. In the postwar years, further industrialization plus increased population put water demand leaps and bounds ahead of new construction.

• **The New York story**—New York's water situation was the prime case in point in 1950. There had been no shortage of planning. Such insurmountable obstacles as a depression and a world conflict had put the city where it was. And some foot-dragging by political forces without the vision to see need for sustained spending had aggravated the situation.

With existing reservoirs only one-third full and public opinion completely aroused at the start of 1950, New York City pushed construction on its second stage of Delaware River development—for complete diversion by 1955 of the 440-mgd maximum now available to the city under the 1931 U. S. Supreme Court decree. Plans also were under way for the $140-million Stage 3, which would feed 323 mgd more through a 44-mile tunnel into the second-stage systems. At the year's end the city's corporation counsel had in preparation a petition asking the Supreme Court to raise its earlier limit on diversion from the upper Delaware watershed, which is required for this third stage.

• **A promising plan**—Meanwhile, the 14-year-old Interstate Commission on the Delaware River Basin released the preliminary report of its consulting engineers on a plan for four-state, integrated development of the Delaware's undeveloped water resources. It also proposed that New Jersey, New York, Pennsylvania and Delaware create by parallel legislation an authority to finance, construct and operate this great water project.

Still another proposal came from communities in northern New Jersey, which came forward with a master plan to provide that region with an additional 100 mgd pending completion of the four-state plan.

• **A grave problem**—The gravity of the water problem of New York's Board of Water Supply was emphasized by its decision to resort to pumping from the Hudson River as an emergency measure pending completion of the current work on the upper Delaware. In February the board received bids on both design and construction of a plant of 100-mgd capacity on the river at a point where water could be pumped into a shaft of the Delaware aqueduct. By the end of the year construction of the plant was substantially completed.

• **Artificial rain**—A second radical departure, made by the city to meet its critical water shortage was employment of a meteorologist to stimulate precipitation in the area where its major reservoirs are located. How much effect his cloud seeding operations had in producing the rainfall that ended the water scarcity by year's end has not been determined.

In the Far West and Southwest, where artificial precipitation was weaned (after being cradled in Schenectady), competitive commercial operations debated the relative merits of airborne and ground-based generators of silver-iodide smoke as the artificial nucleus of raindrops. And while some seemed sold on the smoke system, others stuck to use of dry ice—and claimed success.

The California Electric Power Co. wound up two years of dry-icing the High Sierra clouds with the firm conviction that its efforts had increased the snowfall—perhaps 12 to 14%. This amount of snow meant 6,500 acre-ft of bonus runoff—some 14,300,000 kwhr—which, said the company, would cost $56,000 if generated by steam. Plane operation and ice cost it far less.

Senator Anderson from New Mexico saw rainmaking in the same light as atom splitting and drafted a bill to provide federal control. His concern was possible damage caused by experiments. In broad outline, he would: create a commission with powers to enforce rules, exempt any licensed cloud seeder from damage liability, regulate rates paid rainmakers and foster federally supervised private research.

• **Water for synthetic fuel**—A water-supply survey of national importance was undertaken during 1950 in connection with studies of synthetic liquid-fuel production being made for the Department of the Interior. Consultants engaged by the Corps of Engineers at the request of the Interior Department made a check on the available reserves of water in all areas where coal, natural gas or oil shale could be used to produce fuels. This check ultimately will cover 37 states and Alaska and will include estimates of cost of obtaining the water. Detailed studies were confined to 24 states and Alaska where the needed raw materials for fuel were found in sufficient quantity.

Taking a 10,000 bbl-per-day fuel plant as a study unit, the consultants set possible plant locations and capacities, based on factors that included a 13-mgd water demand per unit. Their reports are expected to be published by the Bureau of Mines. They should also be of value to industries looking for locations where ample supplies of water are available.

• **Marketing the product**—Producers of water felt the pinch of cost increases and looked to pass them on to the consumer. Rate increases already granted range around 35% and run as high as 70% —in Tulsa, Okla.—indicating just how far behind present-day prices water rates have fallen.

Before World War II, 55 cents of every water-bill dollar was left, after operational and maintenance costs, to be spent for fixed charges and plant expansion. Operating costs now eat up all but 35 cents, and that remainder won't go so far these days. And so, the backlog of needed water supply construction grows.

• **Enriching the product**—Perhaps more words were spoken and written last year on fluoridation of water for prevention of tooth decay than on any other single facet of water treatment.

It was the first full year after the American Water Works Association had imprinted its official stamp of approval on fluoridation (where used with local authorization and scientific control). The American Dental Association resolved that its state components might sanction fluoridation if they saw fit, and the U. S. Public Health Service took an approving stand. City after city checked in with word of studies started or programs authorized.

While an impressive number of cities (over 30 in Wisconsin alone) sought to fight dental caries with fluorides, some remained to be convinced. The cautious and the skeptical kept an eye on Newburgh and Kingston, N. Y., from whence came tentative reports, as a 10-yr test period reached its midway mark. Encouraging results were reported in Newburgh children: 30% less tooth decay than in Kingston children not drinking water with fluorides. New York State's Department of Health was already sufficiently encouraged to drop earlier rigid controls requiring stringent dental and medical regulation in towns adding fluorides to supplies.

Some of those not sold on the subject questioned its social propriety rather than its scientific soundness. The social implications of mass medication were bothersome. Would this business of enriching water supplies—as opposed to making them safe and inoffensive—stop at fluoridation? If it is perfectly proper, why should it stop until every imaginable benefit, including vitamins A to Z, has been added and every known stimulus to disease, no matter how few persons it affects, has been removed? These questions remained in the minds of engineers as yet undecided on how far water enrichment might go, how far their responsibility extended.

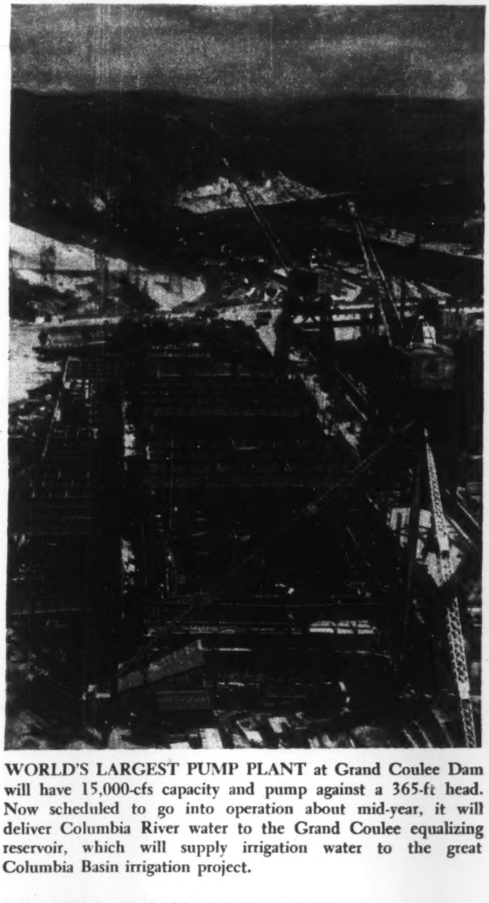
In South Dakota and in Texas, where over-abundance of fluorides occurs naturally and mottles teeth, the U. S. Public Health Service set about providing fluoride-removal plants.

• **Research into radioactivity**—Two automatic machines for detecting and measuring the amounts of radioactive materials in water—under study in 1950 at Chicago's South District Filtration Plant—may prove valuable in the event of an atomic bomb attack. One machine monitors the raw-water supply, indicating the presence of radioactive materials in the water. The other determines the radioactivity of water by testing concentrated samples.

Objectives of this research are to develop dependable and quick methods of determining the degree of radioactivity of the water; establish safe tolerances for nuclear fission materials produced by an atomic explosion; and to find practical and economical ways for removing these materials from large volumes of water being treated by coagulation, sedimentation and filtration. So far, research has been conducted only with radioactive iodine, but Chicago's filtration engineers and chemists hope to get other nuclear fission materials from the Atomic Energy Commission for expanding their research program.

• **Other research—and results**—Also from Chicago came reports of continuing progress in using the electron microscope in making routing determinations of coliform bacteria in water samples. An 85% confirmation has been secured between results of the microscope, which can be obtained in as little as 16 hours, and results of parallel standard methods, which require from two to five days. Up to 50 samples per day have been tested with the electron microscope.

As a direct result of continued research in another direction, two small diatomaceous-earth filters were at work on domestic water supplies last year, performing to prove their apparent reliability. Improved designs give the diatomite filter certain advantages in size and cost that might indicate its future use in installations treating relatively large supplies.



**WORLD'S LARGEST PUMP PLANT at Grand Coulee Dam will have 15,000-cfs capacity and pump against a 365-ft head. Now scheduled to go into operation about mid-year, it will deliver Columbia River water to the Grand Coulee equalizing reservoir, which will supply irrigation water to the great Columbia Basin irrigation project.**

• **Stream pollution: Whose worry?**—"Pollution control should be exercised at the lowest level of government that can handle the problems."

That assertion was the keynote of last year's national meeting of sewage and industrial waste disposal engineers. And there was ample evidence to support the affirmation. The states, acting singly and jointly, were doing a job in 1950—a job that kept the public as well as the profession constantly mindful of the evils of stream pollution, the importance of its abatement.

California veered from the conventional in writing its new pollution control law, in effect last year. The law calls for establishment of individual requirements in each case of waste discharge, requirements in accord with possible uses to be made of the receiving water. There is no set statewide standard.

Long a leader in the clean-streams drive, Pennsylvania had issued orders to build or augment sewage treatment works to 45% of all its municipalities that come under the state law. Later in the year, the money snag had been hit, and cities were said to be claiming lack of funds as an excuse for lack of progress. But by year's end some $22,000,000 worth of treatment works were under way.

Still unsolved in Pennsylvania is the question of pollution of streams by acid mine wastes, which are specifically exempted under the state's stream-pollution act.

Kentucky got itself a new law, and a pollution control commission during 1950. All dischargers of wastes must now obtain a permit to continue, and no new discharge will be legal without commission approval.

Oregon cracked down on paper mill wastes last year and gave offenders till the end of 1951 to cease pollution. Virginia also bore down on procastinators. Michigan went to work on a program to clean up the Detroit area.

• **Basinwide abatement**—To do the pollution abatement job properly on interstate streams takes interstate cooperation. And 1950's outstanding example of such joint action was the Ohio River Valley Water Sanitation Commission.

Making good headway in a regional attack on pollution by eight member states, the commission last year set up industry-action committees to study possible salvaging of waste materials, improvement of treatment and cutting of costs through better plant practice. Over 150 cities with populations above 5,000 in the Ohio River Basin have moved—with the commission's prodding—toward suitable waste-treatment facilities.

A possible check on the Ohio commission's activities developed early in the year. West Virginia's Supreme

Court of Appeals upheld the state auditor who had challenged constitutionality of his state's ratification of the compact, withholding funds from it. With Ohio and Pennsylvania participation contingent on participation by West Virginia, this action threatened the future of the entire compact. Consequently, West Virginia's commisioners asked the Supreme Court of the United States to rule on what was considered to be a question involving the validity of all interstate compacts. The court accepted the case but had not made a finding as this was written.

In another basin, the Potomac, another interstate commission saw past efforts blossom into construction as treatment plants got underway in 1950. And more were planned by both cities and industries. One member state, Virginia, has a committee looking into advantages of constructing regional treatment works to service groups of towns, where towns are small. A decision by this committee must be made soon if indecision is not to delay abatement of septic stream conditions.

- **Industry is willing**—More and more industries are beginning to discover that pollution control is good business. It makes for good public relations, and it's often economical. Wastes may be reclaimed for reuse. Metal-platers, for example, now salvage metals and solutions that formerly were wasted. Paper-makers who install save-all equipment not only reclaim valuable fibers formerly lost but kill a second bird with the same stone by permitting waste water relatively free of fibers to be discharged.

Industry's confidence and cooperation has been gained by many state and interstate pollution abatement agencies. And last year the federal government wooed industry with a proposal to set up a technical task committee with numerous working branches to dig into separate problems of industrial pollution. Industry, hungry for information on what the government plans, eagerly accepted. The committee was set up and now is functioning.

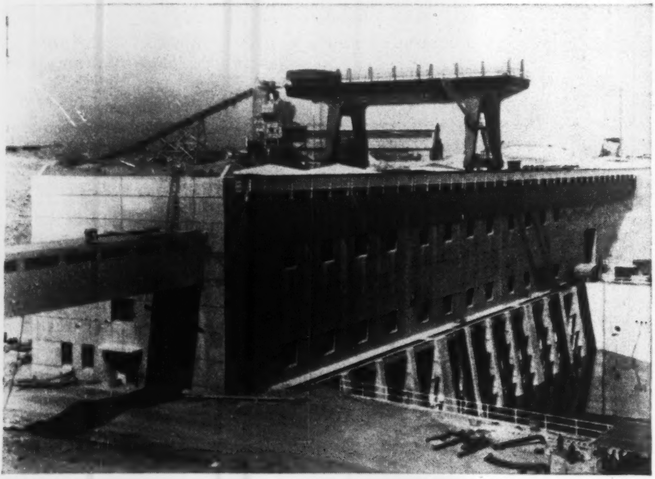
- **Atomic fission**—A project set up in 1948 at Oak Ridge National Laboratory intensified study of potential health hazards in radioactive wastes during 1950. Called the Radioactive Waste Disposal Research Section and made up of staff from that laboratory plus full-time assignees from the U. S. Public Health Service and the Tennessee Valley Authority, this group is giving special attention to treatment of fission wastes and decontamination of waters containing radioisotopes.

A 250-gpd pilot water-treatment plant with mixing, flocculating, settling and filtering equipment, was operated to determine its capability to reduce radioactivity of phosphorous-32 and iodine-131. Operated by standard procedures, the plant (with rapid sand filters having various grades of medium) has hit 96 to 98% $P^{32}$ removals, but only up to 10% removal of $I^{131}$. Modified coagulation processes boosted removals of $I^{131}$ to 25%.

Reason for studying $P^{32}$ and $I^{131}$ is that these isotopes make up 82% of the total millicuries of radioisotopes shipped from Oak Ridge to non-AEC users who are most likely to discharge them after use into municipal sewerage and streams.

Experiments were run on special phosphate coagulation for increased efficiency of radioisotope filtration. Also, trickling filter and activated sludge processes were tested. Another phase of studies went into dispersion of radioactive materials in natural water courses, which was paralleled by development of field survey instruments.

It would appear from all this evidence of intensive research and concrete findings that the unknowns are succumbing, the bugbears being dispelled. Light con-



**TRACY PUMPING PLANT** of California's Central Valley Project neared completion in 1950. It will lift 4,600 cfs 200 ft to the Delta-Mendota Canal. Six electrically driven pumps will have a total of 135,000 hp; they'll be operated with power from Shasta and Keswick dams. Total cost of the vital pump installation is to be $21,000,000.

centrations of radioactivity may be removed from wastes by ordinary sanitary engineering methods—not by storage and dispersal alone.

• **Sewer charges**—At midyear, New York City joined Buffalo, Cleveland, Detroit, Philadelphia and other cities by instituting a sewer rental—one-third the water bill. Thus, an over-strained real-estate tax was relieved, a troublesome debt limitation sidestepped and a $15,000,000-a-year revenue assured. Encouraging was the absence of loud opposition to the new charge, indicating a growing public consciousness of the need for sewage treatment works.

In Los Angeles, another sewer charge system that would have set flat rates for business and residential owners to produce an income of nearly $6,000,000 was proposed, but turned down.

The authority method of financing sewage works continued to gain in favor. Bonds of municipal sewer authorities continued to be a highly attractive investment.

• **Policies and public health**—The Public Health Service consulted with three dozen leaders in the sanitary engineering field and came out with some interesting ideas on training and employment of the profession last year. Its conference with representatives of the profession was prompted by the fact that sanitation is a vital factor in economic development abroad.

These were among the opinions gathered:

Schooling should extend to five years—four toward a bachelor's degree in sanitary engineering, one in public health studies. Field training can supplement, can't be a substitute for schooling. Sanitary engineers' salaries should be lifted. Sanitary engineers should strive to go farther in the less technical fields of public health.

As evidence of successes the profession was having in the field of public health, the Rockefeller Foundation anounced it would resettle Sardinia with 1,000,000 people, now that it has been rid of the malaria mosquito. There was not a single new case of the fever on the island last year.

## RIVER CONTROL AND USE

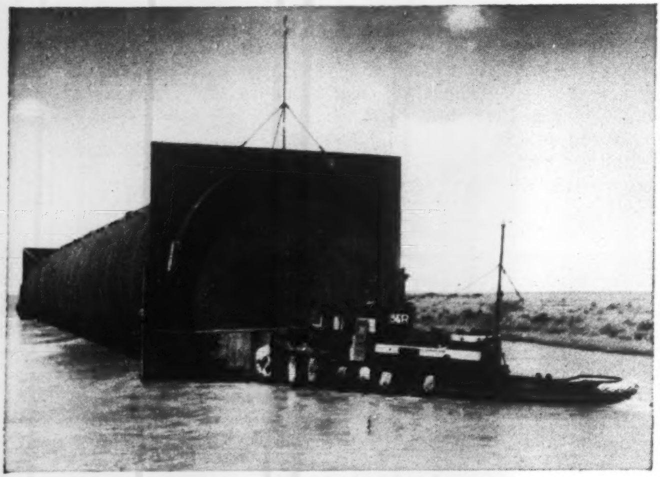
Questions relating to the development and use of the nation's rivers received an unusual amount of attention early in 1950 as a result of the appointment by President Truman of a commission to determine what federal policy should be toward development of the nation's water resources. Following appointment of the President's Water Resources Policy Commission the Engineers' Joint Council named a Water Policy Panel to assist the President's commission by bringing together the best thinking of the engineers of this country on the problem before it.

The President's commission was headed by Morris L. Cooke, consulting engineer, and included Samuel B. Morris, chief engineer of the Los Angeles Department of Water and Power; Leland Olds, former member of the Federal Power Commission; three college presidents and one college dean.

The EJC panel was headed by W. W. Horner, past president of the American Society of Civil Engineers, and included a representative from each of the principal engineering societies. Many other engineers served on its task forces and coordinating committee.

Considering the background of the President's commission and the many men from federal agencies that participated in its work, and the background of the men on the EJC panel and its task forces, the two reports were not as far apart as might have been expected. Both were in agreement as to the need for a

**CLARK HILL DAM** on the Savannah River in Georgia and South Carolina came into prominence recently as a possible source of power for the projected new atomic energy in that region. Its power capacity will be 280,000 kw, and all seven 40,000-kw units are to go in at once. The project is nearly three-quarters done.



**TUGS BRING LAST SECTION** to position for the Baytown-La Porte vehicle tunnel under the Houston Ship Channel. The sections were fabricated at Orange, Texas, bulkheaded and ballasted for towing to the site. As an innovation, these single-thickness steel tubes are lined with concrete on the inside only. There will be no envelope of concrete outside the steel.

clearly defined federal policy, for much more attention to orderly development of the water resources of an entire river, for more rational allocation of costs and for more careful accounting.

As was to be expected, the EJC group stressed the desirability of local sponsorship and development, either public or private, with a minimum of federal participation. The Cooke commission favored federal action, especially on power. Both favored impartial review of all major river development work and approval by a high-level review board before any project could be authorized by Congress.

The Cooke Commission recommended that the imposition of tolls on waterways be "considered" as a part of a national policy but did not propose it as a fixed policy. The EJC group said that no new toll-free artificial canals should be built and that a study should be made of levying tolls on other types of navigation works.

The Cooke commission placed special emphasis on the desirability of unified planning for entire river basins. In that planning it favored consideration of projects that could not be justified on an economic basis but which were socially desirable. In a report issued late in February of this year it set forth specific proposals for the major river basins of this country.

• **River development work**—The need for more rational planning of federal power, flood-control and irrigation work, and especially for a detached review of the projects put forward by federal agencies, was very apparent as 1950 drew to a close.

Although most of the money spent during the year was spent on projects started in previous years—under instructions from the President to limit new projects as a means for keeping the federal expenditures within bounds—there was no lack of planning and promotion of new work, especially power projects in the West. As a result, some projects not yet approved by Congress are in the budget that went to Congress early this year.

Justification for proposing a start on these projects at this time is that they will provide power for the defense program or irrigated land for the production of food.

An outstanding example of this effort to use the defense program as an excuse for starting projects not yet approved by Congress is the Hell's Canyon power project on the Snake River, which engineers outside the federal service characterize as one of the most difficult to build and most uneconomical in the Columbia River system.

• **Flood-control progress**—Little new flood-control work was started in 1950 but substantial gains were made on the many large projects started in previous years, such as the large dams on the Missouri River.

Among the few projects to be started is an unusual one in Florida designed to end the flooding of large areas in the Everglades and add to the underground sources on which the resort cities of the east coast depend for their water.

• **Flood handled easily**—The third greatest flood in the lower Mississippi valley since 1844 was carried to the sea with no trouble during the past year, in striking contrast to what happened in the years before the present flood-control facilities were built. The Bonnet Carre spillway, which diverts water from the main river above New Orleans, had to be operated for 37 days to keep the flood crest within safe limits as it passed that city.

This flood did, however, point to the need for the floodways down through the Atchafalaya River valley. Had the volume been only slightly larger it would have been necessary to use the incomplete Morganza floodway, which would have caused much damage. Completion of that floodway now is being rushed.

**• Unsettled water questions**—The year 1950 went by with very little done toward settling western water questions—questions like the dispute between California and Arizona over Colorado River water and the interagency dispute on the federal level over who should build and operate water projects. If anything, these situations became more confused.

The long-standing dispute between California and Arizona over their share of the waters of the Colorado River water is an example:

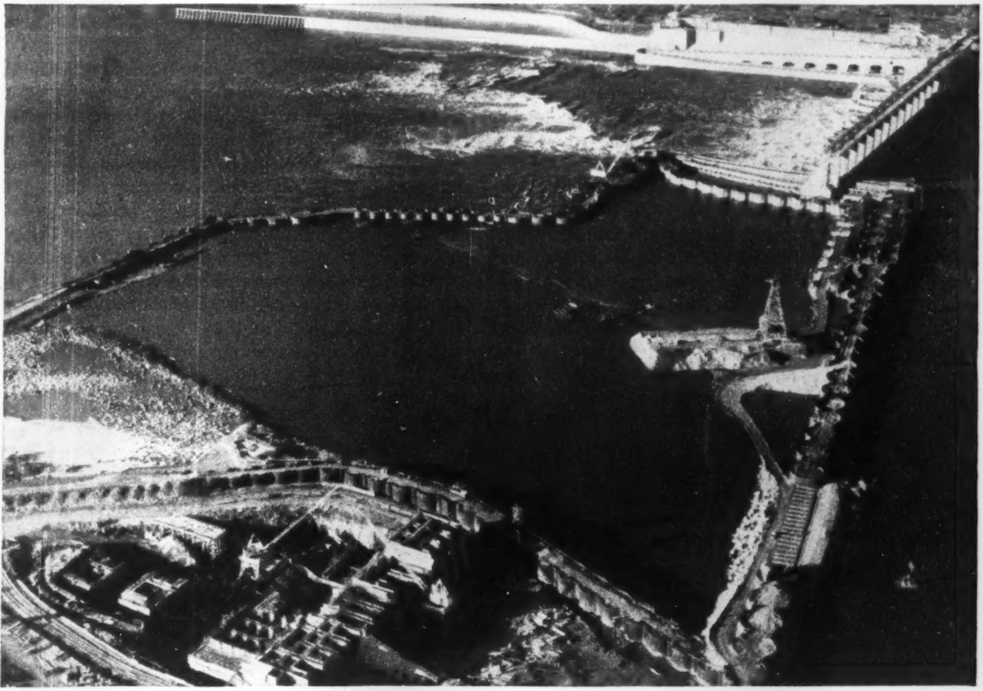
California has tried for a long time to get that issue before the Supreme Court for adjudication, but without success. With good reason, Californians want their dispute with Arizona settled before Congress approves the costly project to deliver Colorado River water to central Arizona. They are concerned, therefore, to find the Central-Arizona project appearing in Congress before they have succeeded in getting Congress to send the interstate dispute to the high court.

To add to the growing concern over this issue in California, the Bureau of Reclamation, without a request from anyone in the official California family, has inaugurated an investigation of the feasibility of importing water to California from the Columbia River.

Californians see in this a move to demonstrate that they do not need Colorado River water badly because another and more abundant source is available. And to add further to their embarrassment, people in the Pacific Northwest fear that this is a move on the part of California to grab their water!

**• Inter-agency squabbling**—Negative progress has been achieved in the conflict between the Bureau of Reclamation and the Corps of Engineers over project jurisdiction. A year ago, the so-called "Folsom Formula" was hailed as spelling out responsibilities of these two agencies. In recent hearings on the West Coast, however, Congressman Engle, author of the Folsom bill, said that the formula was intended to apply only to works in connection with Folsom Dam. Its application to other projects by the executive department, he said, is unauthorized. Thus, on each new project where both agencies have an interest, the various responsibilities still will have to be carefully delineated by Congress.

**• Western water laws upheld**—An important question of scope of western water laws was settled by the



GREATEST RIVER DIVERSION JOB since Bonneville Dam was built across the lower Columbia River is here shown at its successful completion. It was at McNary Dam, farther upstream on the Columbia. In the cellular wall of the final cofferdam for that dam is the closure point (lower right), where 12-ton concrete tetrahedrons were dropped from a cableway to slow the flow of 100,000 cubic feet per second so that rock and later impervious fill could be dumped into the opening and not be swept away. The movable tower of the cableway used for this task is on the fill back of the main cofferdam.

Supreme Court in 1950. It involved lands located below Friant Dam of the Central Valley project in California whose owners claimed that they had been wrongfully deprived of their water without compensation through construction of the dam. The court upheld their contention, thereby giving assurance that the federal government, hereafter, must recognize rights created by the water laws of the western states.

• **International agreements**—Construction of the first of three dams across the international section of the Rio Grande called for under the 1945 treaty with Mexico was started during 1950 and work on Davis Dam on the Colorado, construction of which was required by the agreement, approached completion. Also, Mexico completed work on the diversion dam that the treaty stipulated should be built across the Colorado River where it forms the boundary between the two countries.

Consummated during 1950 was the long pending agreement between Canada and the United States giving formal sanction to informal arrangements permitting larger diversions of water for power around Niagara Falls. Remedial works above the falls to obtain better distribution of water over the falls also were covered. Some of this work has been done.

This new agreement makes possible a large increase in the power that can be generated with Niagara water. Instead of specifying the amount of water that each country can use for power purposes it specifies the amount of flow to be maintained over the falls during each season of the year and at different times of day and night. All other water can be used for power.

An additional 1,132,000 kw can be developed on the New York side with this water, according to estimates of the Federal Power Commission. What agency is to develop that power has not been decided. Ontario already has started construction of a large new plant on the Canadian side.

Canada's growing need for power has resulted in considerable criticism of the U. S. government for continuing failure to act on the 1941 agreement for joint development of the international section of the St. Lawrence River for navigation and power. President Truman also favors that project, but Congress takes its own time.

Within recent weeks the Federal Power Commission turned down an application from the Power Authority of the State of New York for a license to develop the power jointly with the Ontario Hydro. It did so on the ground that New York's plans made no provision for the seaway. President Truman wants the power developed by a federal agency because he fears that New England would get none of the power if developed by New York's power authority.

• **More power needed**—Construction of steam and hydro power plants continued at an unprecedented rate during 1950, and as 1951 opened there was every indication that the high rate will continue. A large contributor to the demand is the Atomic Energy Commission, which needs very large blocks of power for its new plants. As an example, Electric Energy, Inc., a new company set up by five electric utilities, is building a power station in southern Illinois with a capacity of 652,000 kw to supply *half* the power needs of the commission's projected plant near Paducah, Ky.

For the same purpose, Congress, early this year, made an emergency appropriation to cover the cost of two new steam plants for the Tennessee Valley Authority, the Shawnee plant on the Ohio River near Paducah and the Kingston plant on the Tennessee near Kingston, Tenn. Each will have four units of 135,000 kw. each.

• **Pumped storage of power**—Two recent develoments point to growing interest in this country in the possibilities of providing power to meet peak demands by pumping water from a lower reservoir to a higher reservoir during off hours from whence it can be returned through power generators at times of peak demand. That system is widely used in Germany, but until late last year there was only one pumped-storage plant in this country, at New Milford, Conn.

THE LARGEST GAS PIPE LINE yet built—having a 34-in. diameter as compared to 24 in. for the "Big Inch"—now is bringing gas to Northern California from the state's southern border, a distance of about 500 miles.

It, however, operates on a seasonal rather than on a daily basis, as is the usual practice.

The second pumped storage plant in this country was put in operation in October 1950. It is at Buchanan Dam on the Colorado River in Texas and uses surplus power from steam plants of the Lower Colorado River Authority at night to pump water from the pool below the dam up into the Buchanan reservoir for use in generating power at times of peak load.

During the year the Allis-Chalmers Manufacturing Co. had under test in its plant at Milwaukee two units designed to act both as pump and power generator in a pumped storage plant. Present practice is to have a separate unit for each operation.

The company believes that a single unit can be made to function efficiently, both as a pump and as a power generator, thus making a considerable saving in first cost. With a combination pump-turbine unit the time required for pumping will be longer than the regenerating period, consequently somewhat more power will be required than is the case where separate units are used.

• **Cooler concrete for dams**—Concrete temperatures for two dams under construction last year were set at a maximum of 50 deg F when delivered at the dam, which is a new low in specifying cool concrete to minimize the problems caused by the heat of hydration. These structures are Detroit Dam in Oregon and Philpott Dam in Virginia. Because of the base thickness of Detroit Dam (330 ft) this low temperature will not entirely eliminate the need for imbedded cooling pipes but it will materially reduce their number.

To meet this low temperature requirement the contractor cools the coarse aggregate by inundating it in water cooled to 35 deg. Sand and cement are cooled by means of heat exchangers in the screw conveyors through which cold water is circulated, and water chilled to 35 deg. is used in mixing. At Philpott Dam, aggregates were air-cooled and ice was added to the mixing water.

# TRANSPORTATION

Roadbuilding and airport construction continued to be the construction industry's principal service to the nation's transportation agencies during 1950.

• **Roadbuilding lags**—Although expenditures on highways have risen steadily since World War II, all highway authorities are in agreement that the amount spent on new construction in any one of those years was inadequate. Many believe that the current rate, although approaching $3.8 billion dollars when debt service and all types of road and street maintenance and construction are included, is scarcely sufficient to offset obsolesence. Certainly, the steady rise in maintenance costs points that way.

Of the 218,000 miles of rural highways in the primary federal-aid highway system, the Bureau of Public Roads estimates that 158,000 miles need improvement, and of the 14,000 miles of that system in the cities, 10,000 miles need to be modernized. Federal aid now is at the $450-million-a-year level, and Congress has authorized an increase to $500 million for the fiscal years 1952–1953.

Although that amount is not adequate from the long-range viewpoint it probably does represent a realistic appraisal of what the state highway departments can match and use during the years immediately ahead. In fact, some states have not been able to find money to match their allocations of federal aid under the current authorization.

To help meet this latter situation, as well as to speed the modernization or replacement of inadequate highways, the Federal-Aid Highway Act of 1950 contained a provision designed to develop a new source of local road money. That act authorizes states, cities and other political subdivisions entitled to receive federal highway aid to use their federal-aid allotments in future years to pay off bonds issued at this time to permit them to enlarge their current undertakings.

**BLUE RIDGE PARKWAY crosses a state highway near Mt. Mitchell in North Carolina. The parkway's total paved mileage will be increased to 323 this year. Total paved mileage on this national road will eventually be 477 miles.**

For cities, this provision has great potentialities. It will permit them to issue bonds to cover the cost of badly needed traffic-relief arteries or freeways, thus making it possible for them to complete projects in a few years that would require many years if such costly work had to be financed out of current income.

• **Highways during mobilization**—What effect the mobilization for defense will have on road building cannot yet be determined. The Bureau of Public Roads has been asked to urge the state highway departments to concentrate on the 40,000-mi interstate system and its connecting roads as being the most essential to the defense program.

Mobilization Director Wilson also has let it be known that, until the peak of the defense effort is past, highway departments need not expect to get steel for less urgent highway work or for projects that will not be completed for two or three years. And Mr. Wilson has said that every possible assistance will be given to the departments in their work of maintaining existing highways in serviceable condition.

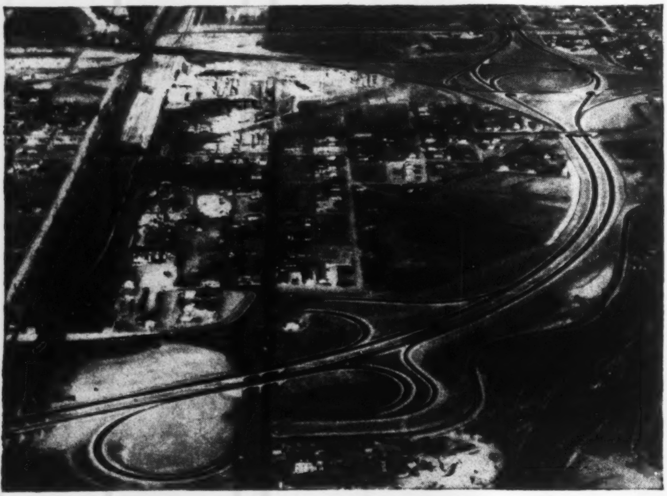
This statement would appear to indicate that Mr. Wilson foresees the possible need for curtailing new construction even on the interstate system. Just why any curtailment of needed new highway building should be necessary is not apparent, and it should be avoided if possible because the expansion of this country's productive capacity that is inherent in the defense program will add materially to the traffic on highways that already are overloaded. Inevitably, that means greater wear and tear and shortened life.

• **Maintenance expenditures rise**—That the present rate of traffic is wearing out the nation's highways faster han they are being replaced or modernized is evident n the steady rise in maintenance expenditures since 1942, when preparations for World War II caused a sharp cut in new road construction. The preceding ten years had seen only slight increases in the money spent on maintenance. But now, as a result of the cut made during the war years, this country is rapidly approaching the time when half of every dollar of highway income will be required for maintenance.

• **Pavement tested under truck loads**—Rising interest in how to keep existing highways from breaking down under an increasing volume of traffic has centered nation-wide attention on a test of the effect of different truck loads that was conducted on a section of concrete pavement in Maryland last year. The section of highway selected had been built in 1941 and was considered typical of many miles of pavement in this country. Loads used on the four half-mile sections into which the pavement was divided were as follows: 18,000 lb on a single rear axle, 22,400 lb on a single rear axle, 32,000 lb on tandem rear axles, and 44,800 lb on tandem axles.

Two trucks with these loadings were operated over each section continuously for six months and at such a rate that the test loading was applied at any one point at a frequency of about one application a minute.

Although numerous questions as to the method of conducting the test have been raised by trucking organizations, the demonstration that the test road gave of the damage that could be done by loads in excess of the widely used 18,000-lb axle load limit is very impressive, even when allowance is made for errors in conducting the tests that may have exaggerated the destructive effect of the moving loads. Only minor damage was done to the pavement over which the 18,000-lb axle loads were operated; more injury was done to the parallel strip over which the 22,400-lb loads moved; still more was done by the 32,000-lb loading, and so much damage was done by the 44,000-lb loads on twin axles that operation of trucks in that lane was discontinued



**DIRECTIONAL FLOW INTERCHANGES on Denver's Valley Highway are designed to permit traffic to enter and leave the northern end without causing traffic congestion. Ultimately, the Valley Highway will have a connection to the toll road now being built from Denver to Boulder.**

**THE FIRST SECTION** of Detroit's John C. Lodge Expressway went into service in 1950. It is only 0.6 miles long, but a mile more is to be ready to be put in service this year.

about two months before the scheduled end of the tests to avoid complete destruction of the pavement.

• **More toll roads**—Toll road planning and construction reached a new high level in 1950. New Hampshire's toll highway, which provides a continuation of Maine's toll turnpike to the Massachusetts line, and Pennsylvania's eastern extension of its toll turnpike to the outskirts of Philadelphia were opened to traffic during the year.

Construction of the western extension of the Penn Turnpike to the Ohio line is well along toward completion.

Contracts for most of the work on New Jersey's toll turnpike had been let by the end of 1950, and work on a toll road from Denver to Boulder, Colorado, got under way.

Oklahoma finally succeeded in getting a purchaser for the $31,000,000 in bonds issued to build a toll highway from Oklahoma City to Tulsa and let one grading contract. Contracts also were let—conditioned on successful sale of bonds—for a toll road to open up a new section of the Atlantic Seaboard to development in Virginia and North Carolina.

Ohio got into difficulties with its plan to build a toll highway across the state from the western end of the Pennsylvania Turnpike as a result of the state auditor's refusal to approve vouchers issued by the State Highway Department to pay the fees of consulting engineers engaged to make traffic surveys and design studies for the toll road. Later, the Ohio Supreme Court ordered the fees paid without passing on the constitutionality of the turnpike act.

• **New financing methods**—The New Jersey Turnpike Authority evolved a method for financing its $220 million toll turnpike that is expected to save about $12,000,000 in interest charges during construction. Instead of issuing bonds to cover the full amount of the estimated cost and selling the whole issue to a syndicate of banks and bond houses in advance of actual construction, as is done normally, the authority entered into an agreement with a number of insurance companies under which those companies agreed to buy the bonds only as funds were needed to pay contractors. The authority pays the companies one-half of one percent interest on all unissued bonds as security for their agreement to buy those bonds when issued.

A still more novel financing method was evolved for the New York State Thruway Authority when it discovered that the money required to build its projected 468-mile cross-state expressway would cut too deeply into revenues needed for other highway work. The authority's financial advisors came up with a plan to sell special licenses to those who wished to use the thruway. Seasonal licenses—costing from $5 to $80 per year—would be sold to regular truck operators or owners of private automobiles who plan to use the thruway frequently. Trip licenses would be sold to infrequent users.

Advantages claimed for this plan are that access points to the thruway will not have to be as limited in number as on a toll road where tolls must be collected at such points; toll collection costs will be eliminated and—the promoters of the scheme hope—the highway will not be classified as a toll highway by federal authorities and so will be eligible to receive federal aid to the extent of half the construction costs. As yet, the Bureau of Public Roads has not taken a stand on this latter question.

• **Roadbuilding techniques**—An important development in roadbuilding that made considerable progress during 1950 was the study of the possible beneficial effect of adding small quantities of rubber to bituminous paving mixes. That study was begun in a small way in 1948. By the end of last year enough test installations had been made in various parts of the country and under different conditions to insure conclusive results. It will, however, be many years before the test sections will give an answer to such questions as whether the rubber does add very materially to the life of bituminous pavements, as the proponents claim.

We do know that rubber improves the homogenity of the hot mix as it comes from the paver, that it reduces the tendency of bituminous surfacing to crack over joints in the old concrete when laid over old pavements, at least during the early years, and that pavement containing rubber loses its skid-resisting qualities less rapidly than does newly laid bituminous material without rubber.

During the year New York State continued its tests of the use of oil sprays as a means for checking the scaling of the surface of concrete pavements on which large amounts of salt are used to control ice formation. In earlier years the state had found that air-entraining agents are effective against weak salt solutions but not against strong solutions. The oil spray is expected to give the needed additional protection.

Current practice now is to apply a spray of petroleum distillate oil, mixed with a volatile mineral spirit, to newly laid pavement at a rate of one gallon to each 34 square yards. This amount of oil is completely taken up by the pavement in about ten minutes and the pavement does not become slick when wet.

**• Stronger pavements**—When the New Jersey Turnpike Authority came to plan for the pavement for its 118-mile toll highway it decided to design for an axle load of 36,000 lb, twice that of recommended standard of the American Association of State Highway Officials. The state's present upper limit is 34,000 lb. Two designs were developed for this loading by the authority's consultants, one for portland-cement concrete and one for asphaltic concrete, and bids were called on both. Bids on asphaltic paving were lower and it is to be used.

The asphaltic concrete in this design is only 4½ in. thick, but it is laid over penetration macadam and water-bound macadam having a total thickness of 8 in., which in turn is laid on a 6-in. subbase and 28 in. of specially prepared subgrade. Thus the pavement now being laid on the New Jersey Turnpike sets a new standard for highway pavement design, being surpassed in load supporting capacity only by the pavements laid on a few military airfields during World War II.

**• Four years of airport building**—In 1950 the Federal Airport Act had its fourth birthday. The Civil Aeronautics Authority announced it had participated under the act in 1,064 projects in the states, 18 in the territories—involving $69,129,000 in federal funds. And in 1950 a new, three-year National Airport Plan set civil airport needs at $928 million, including work on 2,777 airports not yet started, 2,316 already built.

But before the year was out, it became obvious that the average expenditure of $309 million a year needed to effect this three-year plan would not be made. Instead, the federal government planned to spend only $40,000,000 as its share of civil airport cost during 1951. Military airports make up the difference. The budget may run around $500 million for war plane bases in the next fiscal year.

Military airfields to be built under the defense program are to be tailored to fit the planes that are to use the field instead of being built to standard specifications, as was done during World War II. This is expected to result in large savings in many instances as the construction effort required to build runways adequate for today's plane weights and tire pressures may range from 50% more than was required to meet World War II standards to as much as 200% above those requirements. Tire pressures for some types of planes have more than doubled, being as high as 200 lb per sq in., and weights exceeding 350,000 lb must be provided for in some instances.

Use of twin wheels and twin-tandem landing wheels will help some in distributing loads, but the higher tire pressures required for the much heavier planes still make greater strength necessary where big planes are to land.

Similarly, runway lengths will be specified on the basis of the landing and take-off characteristics of the planes that are to use a particular field. These may vary as much as from 3 to 15% for each 1,000 ft altitude for different types of planes. Size of plane is not always the controlling factor.

**• Railroad construction**—New railroad work during 1950 continued to be chiefly line revisions, grade separations, yard improvements and relocations to get rail lines out of reservoirs being built for flood-control or power projects. The largest single undertaking was the 71-mile cut-off of the Chicago, Burlington & Quincy R.R. in Missouri, which will shorten the distance between Chicago and Kansas City on that railroad by 22 miles.

Fills on that new line were built according to compaction methods now widely used in highway work and in earth-dam construction. An additional refinement is the waterproofing of the tops of all fills over 25 ft high with two applications of asphalt. Before ballast is spread, the top 1½ in. is scarified and 0.7 gal. of asphalt oil is applied to each square yard. When it has cured to a tacky consistency, an additional 0.5 gal. is applied and then the surface is rolled with light pneumatic-tired equipment.

Over in Canada, construction is getting under way on the longest new railroad job to be undertaken on this continent in many years, the 358-mile line of the Quebec North Shore and Labrador Ry. Co. to open up the new iron mining region in eastern Quebec and Labrador. It is of special interest to people on this side of the border as a new source of supply for our expanding steel industry.

**• Pipelines do more**—The great natural underground gasholders in the Gulf-Coast region in 1950 began to supply heat to homes in still more parts of the United

States, thanks to the ever-growing optimism of natural-gas companies—and thanks to the pipeline contractors.

These men completed almost 11,000 miles of gas line ranging from 3-in. to 34-in. during the year. Also completed were almost 6,000 miles of pipelines for crude petroleum and its products.

Laying well over 16,000 miles in the United States, then, the pipeliners outdistanced their 15,000-mile-a-year record made shortly after World War II. And it looks now as though performance won't suffer in 1951. Faced by steel shortages due to the universal demand, pipeline builders have been promised adequate supplies because of the vital nature of the commodities transported.

And those commodities continue to expand their usefulness. Gas, for instance, now does more than provide heat for home and factory. New chemical plants are springing up astride the lines. These plants strip hydrocarbons from the gas, which proceeds onward unimpaired for thermal service. The hydrocarbons are processed into a series of synthetics.

Biggest 1950 pipeline news was completion of the 1840-mi 30-in. line from the lower Rio Grande Valley to New York. This line brought natural gas for the first time to a concentrated population of 8,000,000. San Francisco also received gas—via a 506-mile line with the unprecedented diameter of 34 in.

It was in river crossings that the pipe-line builders exhibited greatest ingenuity in 1950. One technique was invented wherein pipe, lying on the bottom, literally burrowed itself down into river-bottom mud. Manifold air-water jets, fixed at a few feet spacing under the pipe and aimed along a line about 20-deg. downward, washed mud from beneath the pipe, allowing it to settle to a depth sufficient to be reasonably safe from harm by scour or anchors.

This method for burying pipe in a river bottom succeeded in soft silt but failed in a clayey bottom.

• **Inland navigation**—Work on development of the nation's inland waterway system during 1950 was widely scattered, ranging from the high-lift lock at McNary Dam on the Columbia River to improvement of the coastal waterway in Florida. The largest single operation was construction of the 8-mile canal and locks to by-pass the Chain of Rocks reach of the Mississippi River above St. Louis. Work also was continued on the locks and channels that will extend the upper end of the Mississippi waterway 4.6 miles farther upstream in the St. Paul district to a new harbor above St. Anthony's Falls. At the lower end of the river, construction of Algiers lock and a 9-mile canal to give better connection between the Mississippi system and the Gulf Intracoastal Waterway is in progress.

• **Rapid transit**—Considerable progress was made during the year on rapid transit systems in several parts of the country. Chicago put the finishing touches on a 3.9-mile addition to its subway system in the Loop District, which has been put into service since the first of this year. Philadelphia was actively engaged in extending its subway system and in completing links with the elevated lines. New York made minor addi-

PORT AUTHORITY

**HUNDREDS OF BUSES** that formerly clogged traffic on New York's West Side now use this new terminal. All buses from New Jersey never touch the streets now as they use ramps at the far end of the terminal building to reach the Lincoln Tunnel. These ramps also permit nearly 500 cars to be parked on the roof.

**BOSTON'S LOGAN AIRPORT is the first in this country to have a direct connection to the city's subway system. Here shown is the interchange station where passengers from the subway, lower right, transfer to buses to the airport terminal near the center of the airfield.**

tions and continued work on improved connections between the many lines converging on Queens Plaza. And in Boston, work is being completed on a 2.1-mile extension of its subway line into East Boston that will give that city the distinction of having a direct subway connection to its major airport.

## PROFESSIONAL

• **Toward unity**—After much fruitless discussion concerning the multiplication of engineering organizations in this country by individual members of those societies, an organized study of that question, which was begun in 1949, brought forward some definite proposals for greater unity late last year.

This study was inaugurated by the Engineers' Joint Council. Representatives of 15 engineering societies participated in the exploratory group which has now placed before the boards of those societies four proposed forms for an overall organization to unify the profession. Plan A calls for expansion of the Engineers' Joint Council to include all societies that are eligible to membership under the council's present constitution. Plan B would expand EJC to include societies not now eligible for membership in that organization. It also provides for voluntary individual membership in the expanded organization. Plan C would merge the Engineers' Joint Council and National Society of Professional Engineers, and Plan D would make the National Society of Professional Engineers the unifying organization, expanding its activities and membership.

Membership in the expanded NSPE still would be limited to registered engineers and engineers-in-training. The five national engineering societies whose top officers now form the Engineers' Joint Council would not participate directly in the expanded NSPE, and, presumably, EJC would be disbanded. Members of those societies who are not members of one of the state societies of professional engineers would have no direct representation on national issues under this latter plan.

These four plans of organization are now before the boards of the participating organizations for study.

• **Group insurance**—Both the American Society of Civil Engineers and the National Society of Professional Engineers now have group insurance programs in effect. In each instance, the society's participation is limited chiefly to making its list of members available to the organization writing the group insurance.

Group insurance for professional societies is not new in the engineering field. The American Association of Engineers entered into a similar arrangement in its heyday, and it appears probable that many of the men who continued their membership in that association long after it ceased to function actively as a national organization did so in order to keep their group insurance in force.

• **Registration now universal**—The year 1950 saw registration of engineers attain complete national coverage. This was accomplished when Congress finally approved a registration law for the District of Columbia after several attempts to pass such a law had failed in earlier years. Registration still is optional in Massachusetts and New Hampshire, and in some other states it does not apply equally to all types of engineers.

• **Training of engineers**—A record number of young engineers graduated from the engineering schools of this country last year—about 47,000—due in large measure to the number of veterans who elected to study engineering under the "G.I. Bill of Rights."

Last year marked the peak of that program and the start of a period of readjustment that has been greatly complicated by resumption of drafting of young men for military service. As was noted in the opening paragraphs of this review section, a definite decline in the number of high school students planning to enter engineering schools had been causing concern among engineering educators before the matter of revival of the draft had been added to their worries.

# THE ECONOMICS OF METER REPAIRS

## SOME TIPS ON GOOD MAINTENANCE PRACTICE

Properly maintained water meters will return the cost of servicing many times over by providing a longer useful life of accurate registration.

Many progressive water works men have a fixed time for removing meters from service. Frequently a replacement meter is immediately installed to avoid interruption in metering. It is suggested that a repaired meter test at least 90 per cent on a ¼ gpm. flow.

These simple tools speed repair work

### Testing Equipment Recommended

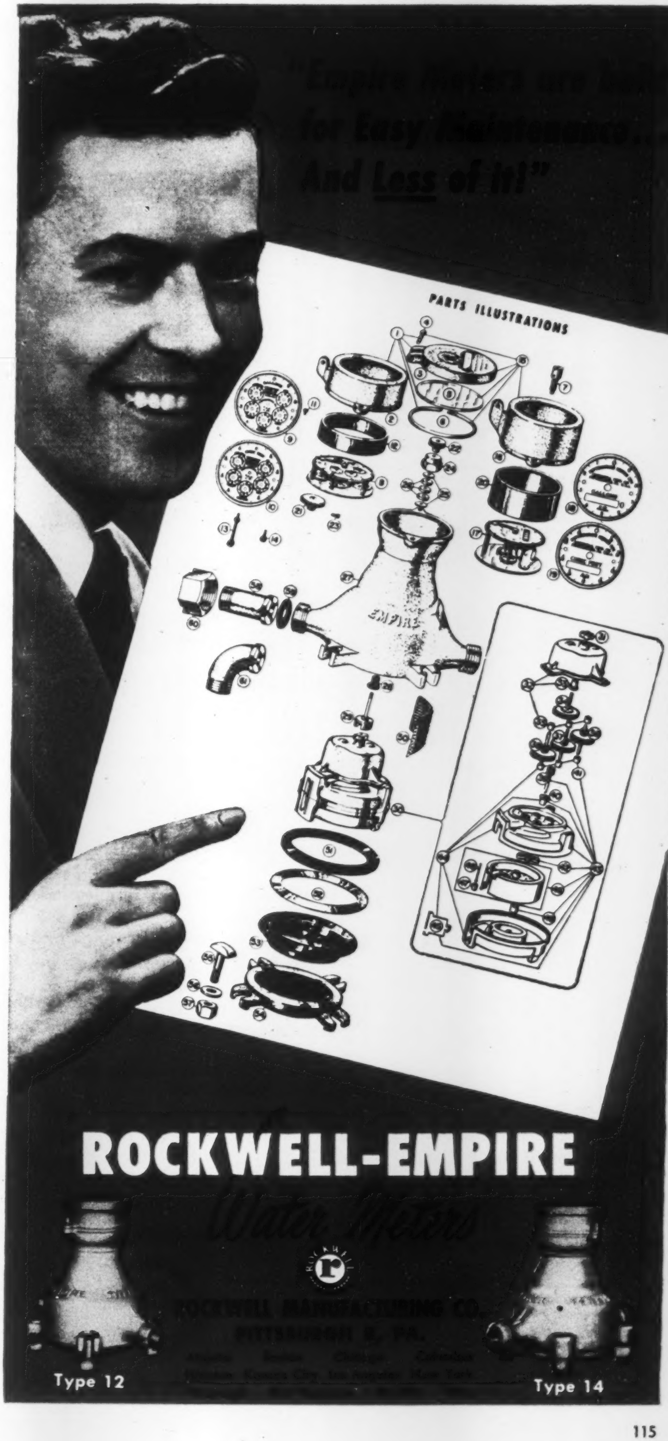
All meter departments should be equipped with proper test stands, preferably of the volumetric type, periodically checked for correct calibration in which both new and repaired meters can be proved for accuracy. The wisest policy is to test all meters before installation. Some facilities should be provided for tests at minimum flow rates. These rates should be carefully checked by means of a stop watch or a rate-of-flow indicating device. The old method of testing on a ¼″ or 1/32″ stream is not recommended today since the orifices will wear and the flow will vary with pressure change.

It has been found through experience that simply taking a meter apart and cleaning the complete assembly is very often all the maintenance required. In old, very worn meters it is wise to assemble complete units such as new gear trains and new discs with new half balls. Oscillating piston meters can usually be restored to new meter performance by simply installing a new piston in the old chamber.

### Storing Meters

When storing meters, either new or repaired, it is advisable to put them in a cool place and preferably to set them upside down. Hard rubber is a sensitive material and prolonged exposure to heat in a closed, unventilated building or to excessive artificial heat can have damaging results. Thus accuracy and pressure tests on meters that have been stored for long periods of time are extremely important.

Proper tools will facilitate meter repair work. Rockwell Manufacturing Co. has developed a simple repair tool set (see cut) that is available at nominal cost. For information write Rockwell at 400 N. Lexington Ave., Pittsburgh 8, Pa.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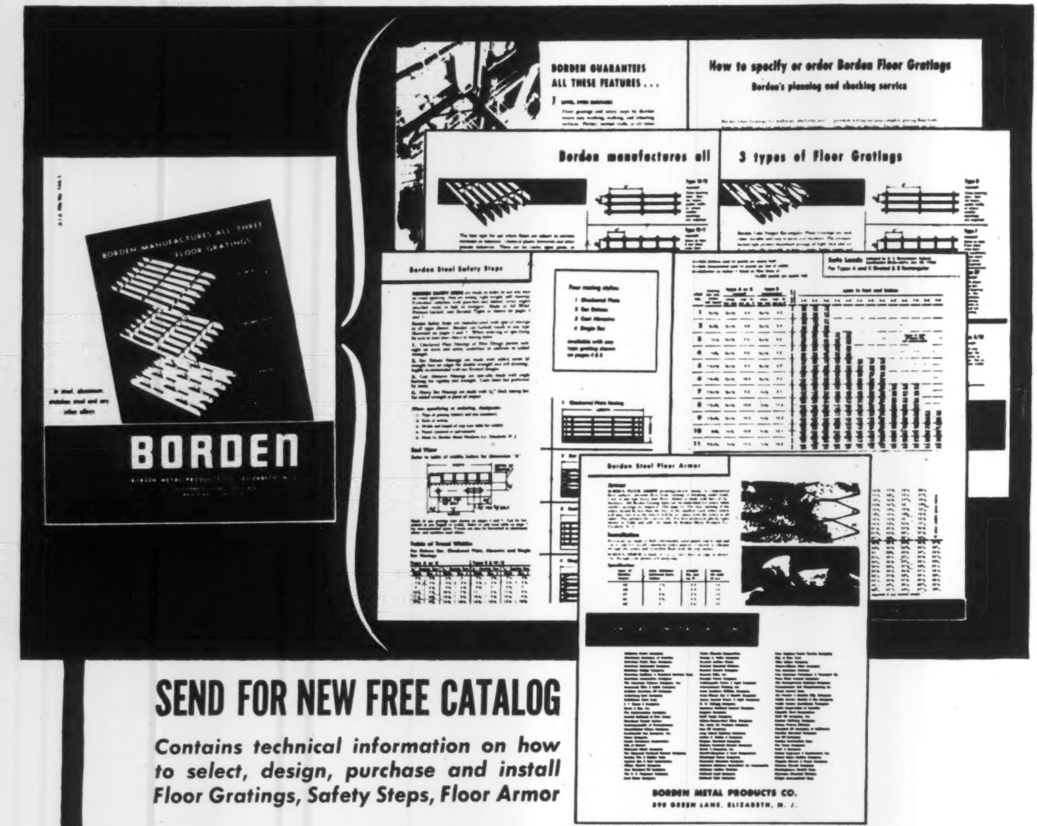
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3. Safeload tables adopted by U. S. Government:
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   - Spans
   - Weight per square foot
   - Panel widths, etc.
4. Step-by-step procedure for ordering, planning and checking to insure the right grating for each job.
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## 1950-51 ANNUAL REPORT ON

# Construction Costs

## BY ENGINEERING NEWS-RECORD

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ENR Construction and Building Cost Indexes; Aberthaw; AGC; American Appraisal; Austin; Boeckh; Fruin-Colnon; Fuller; Marshall & Stevens building and equipment; Smith, Hinchman & Grylls; Turner; Whitman Requardt public utility; ICC railroad; BPR & California roadbuilding, Industrial Building.

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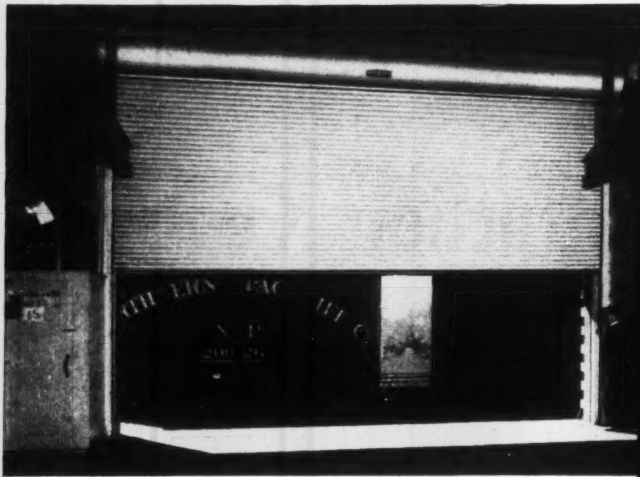
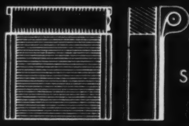
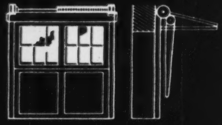
Hope for stabilized construction costs vanished with start of the Korean War and subsequent full-scale mobilization for peace. Instead, construction has an uneasy price freeze and an uneasier and very leaky wage roof. Both were clamped on by Economic Stabilizers in Washington after primary construction costs were already up ten percent. Materials shortages were widespread during the past year and critical for steel and gypsum products. Skilled labor shortages developed in many areas. Record construction volume continues into 1951—as do some of the shortages. Construction men will have much pencil sharpening to do in coping with 1951 costs and labor, materials, and equipment supplies. The pages that follow are dedicated to their success......................



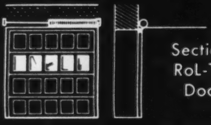
# KINNEAR STEEL ROLLING DOORS



Rolling Fire and Service Doors



Bifolding Doors



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**KINNEAR ROLLING DOORS** — The interlocking steel slat door was *originated* by Kinnear. With smooth, easy, coiling upward action, this famous door glides out of the way overhead, safe from damage. Doorways remain clear *from jamb to jamb and floor to lintel* — until the doors are closed. Wall and floor areas around the opening are always fully usable.

The tough, flexible, all-steel Kinnear curtain assures longer service life, lower maintenance costs, higher resistance to weather, wear, fire and intrusion.

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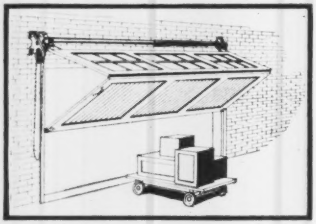
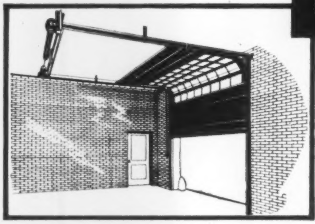
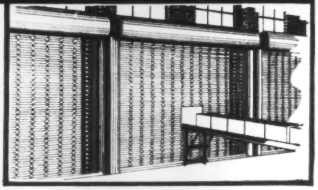


**KINNEAR BIFOLDING DOORS** — Sturdy two-section doors that "jack-knife" to a horizontal, overhead position. Sizes for any opening, with panels for glass to meet any requirement. Also heavy-duty Bifolding Doors with lower section that "telescopes" with top section, both sections then rising overhead.



**KINNEAR RoL-TOP DOORS** — Sectional-type upward-acting doors roll smoothly and easily to a horizontal position overhead. Any number of sections can be paneled for glass. Motor or manual operation. Built in a full range of sizes for industrial, commercial, and residential needs.



**KINNEAR ROLLING GRILLES** — Sturdy, upward-acting curtains of interlocking steel bars and links that protect property without blocking light, vision, ventilation or sound. When not in use, they coil compactly above the opening. Built for openings of any size; easily installed in old or new construction.

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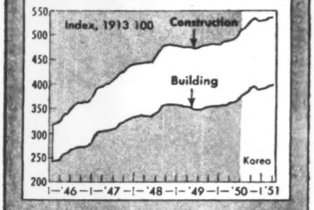
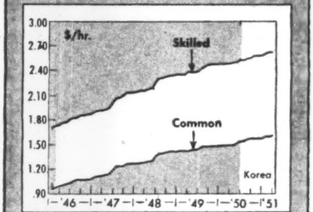
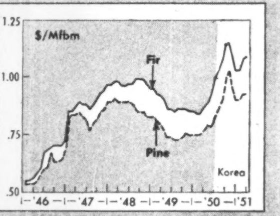
**Construction and building costs shot up to a new all time high in 1950-51 as measured by the Engineering News-Record Construction and Building Cost Indexes.**



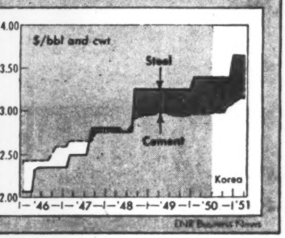
**Wage rates continued their steady climb, with skilled labor going up faster than common labor and both speeding up their wage rises prior to the January, 1951 freeze.**



**Lumber prices shot up past their own previous peaks then backed down a third. They were starting up again when the price freeze was put into effect.**



**Structural steel got a 25-cent raise per cwt at the mill in December, 1950 following its 15-cent raise the previous year. Cement prices held during the first half of 1950 but turned up in the fall.**



ENR Business News

## Engineering News-Record Construction Cost Index—1913=100

| | 1926 | 1932 | 1939 | 1942 | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 207.2 | 162.5 | 234.7 | 267.6 | 302.5 | 316.3 | 387.0 | 441.7 | 477.4 | 484.7 | 530.7 |
| February | 206.6 | 161.8 | 234.3 | 269.4 | 303.7 | 319.5 | 393.7 | 442.7 | 475.4 | 484.9 | 536.7 |
| March | 207.7 | 157.2 | 234.4 | 269.7 | 304.5 | 323.8 | 395.5 | 443.6 | 474.8 | 488.4 | 537.9 |
| April | 207.1 | 153.1 | 234.9 | 271.8 | 306.4 | 334.6 | 399.6 | 443.6 | 474.3 | 491.9 | ..... |
| May | 207.3 | 152.8 | 234.7 | 272.3 | 307.4 | 339.7 | 400.0 | 444.9 | 472.1 | 496.6 | ..... |
| June | 204.8 | 152.2 | 235.0 | 274.2 | 309.0 | 348.7 | 406.6 | 455.8 | 473.8 | 506.9 | ..... |
| July | 207.8 | 153.4 | 234.9 | 277.7 | 309.0 | 354.7 | 413.8 | 464.8 | 477.5 | 512.7 | ..... |
| August | 208.3 | 156.8 | 234.9 | 281.6 | 309.1 | 361.4 | 422.9 | 477.1 | 478.2 | 521.4 | ..... |
| September | 208.3 | 158.0 | 235.0 | 281.6 | 309.3 | 360.2 | 426.4 | 478.4 | 479.8 | 530.4 | ..... |
| October | 209.8 | 159.2 | 236.9 | 282.4 | 309.3 | 360.9 | 434.6 | 480.2 | 480.5 | 534.4 | ..... |
| November | 210.8 | 158.2 | 238.2 | 283.6 | 309.3 | 362.5 | 436.9 | 478.3 | 480.0 | 527.9 | ..... |
| December | 210.8 | 158.5 | 238.2 | 283.7 | 313.5 | 369.3 | 441.1 | 477.7 | 480.3 | 528.7 | ..... |
| **Average** | **208.0** | **157.0** | **235.5** | **276.3** | **307.8** | **346.0** | **413.2** | **460.7** | **477.0** | **509.1** | .... |

## Engineering News-Record Building Cost Index—1913=100

| | 1926 | 1932 | 1939 | 1942 | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January | 182.3 | 150.6 | 196.2 | 217.1 | 236.5 | 242.2 | 294.6 | 333.6 | 354.9 | 356.2 | 391.8 |
| February | 183.7 | 147.2 | 196.2 | 218.4 | 237.7 | 243.9 | 301.6 | 335.5 | 352.9 | 356.5 | 397.0 |
| March | 184.3 | 145.9 | 196.5 | 218.9 | 237.9 | 245.4 | 303.3 | 334.2 | 352.5 | 360.0 | 398.0 |
| April | 184.1 | 135.7 | 196.5 | 219.6 | 238.5 | 254.4 | 305.2 | 334.6 | 351.4 | 362.8 | .... |
| May | 183.6 | 136.4 | 196.6 | 220.1 | 238.5 | 258.1 | 304.6 | 333.9 | 348.9 | 364.3 | .... |
| June | 181.8 | 137.6 | 196.4 | 221.2 | 239.4 | 265.3 | 307.4 | 339.3 | 349.3 | 373.4 | .... |
| July | 184.3 | 139.5 | 196.8 | 223.5 | 239.6 | 267.3 | 308.9 | 342.4 | 349.5 | 377.7 | .... |
| August | 185.1 | 139.4 | 196.5 | 225.4 | 239.9 | 272.3 | 317.8 | 355.5 | 350.9 | 383.1 | .... |
| September | 185.1 | 139.6 | 196.6 | 225.5 | 240.1 | 272.4 | 322.6 | 356.7 | 352.0 | 392.8 | .... |
| October | 188.0 | 140.0 | 198.5 | 225.9 | 240.4 | 273.0 | 327.3 | 357.1 | 353.0 | 396.2 | .... |
| November | 188.0 | 139.5 | 201.2 | 226.6 | 240.6 | 274.0 | 329.2 | 355.9 | 352.9 | 388.9 | .... |
| December | 188.0 | 140.0 | 201.2 | 226.6 | 240.8 | 280.0 | 333.1 | 355.6 | 353.2 | 390.1 | .... |
| **Average** | **184.9** | **140.9** | **197.4** | **222.4** | **239.1** | **262.4** | **313.0** | **344.5** | **351.8** | **375.2** | ..... |

# The outlook for construction costs in 1951

The crystal ball this year is even murkier than usual. The general and joint price-wage freeze, effective January 26, at the highest prices charged between December 19, 1950 and January 25, 1951, is devised as a holding action until selective controls can be contrived.

The wage lid has already been raised a possible 10% with, in addition, several leaks through fringe benefits such as welfare, pensions, cost-of-living escalators that could raise labor costs even more.

What is clear is that metal shortages, particularly acute shortages of steel, copper and aluminum, are upsetting construction time tables, are requiring substitution of materials and methods and are generally playing hob with the construction productivity that was getting so nicely back in the groove.

The drastic credit restrictions that have been imposed on home, business and "frivolous" construction are designed to divert these critical materials away from normal civilian construction into the building of plant to increase the productive capacity of the nation and into direct defense structures. So construction men must convert, from the models for which they were so efficiently tuned up in 1949 and 1950, into high speed construction of defense necessity structures that carry DO numbers.

This switch in type of construction carries with it a geographical switch, too. This will require some rerouting in the established flow of materials from producer to job site. But the big upheaval, cost wise, will be in the recruiting for labor migration out of the areas where new construction lags, into areas where the new boom roars along at high speed. Reintegrating this labor into smoothly functioning crews will cost time, money and supervisory manpower.

So, out of the murk in this year's crystal ball, this pattern takes form:

The "visible" construction costs will probably rise five to ten percent.

But the intangibles, the "invisible" costs due to lower productivity, to speedup in completion schedules in the face of unpredictable materials delivery, to overtime, to bottlenecks beyond the builders' control, to grey and black markets, to bonuses, will be painfully reminiscent of '46 and '47.

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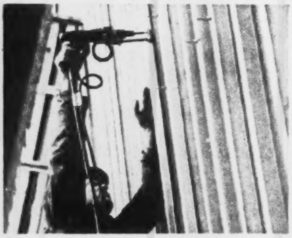
**CORRUGATED ASBESTOS ROOFING AND SIDING**, flat asbestos cement and similar materials. Higher quality installation entirely from top-side or outside. NELWELD fasteners are distributed by Philip Carey Mfg. Co. and Johns-Manville.



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**CORRUGATED ALUMINUM OR STEEL ROOFING AND SIDING** secured at savings up to 40% by this production line method. Nelson Rivweld studs available from U. S. Steel Supply Co., Reynolds Metals, Southern States Iron Roofing Co.

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.............................. materials.

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Company ..............................

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City.................... State..........

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DIVISION MORTON NELWELD GREGORY CORPORATION

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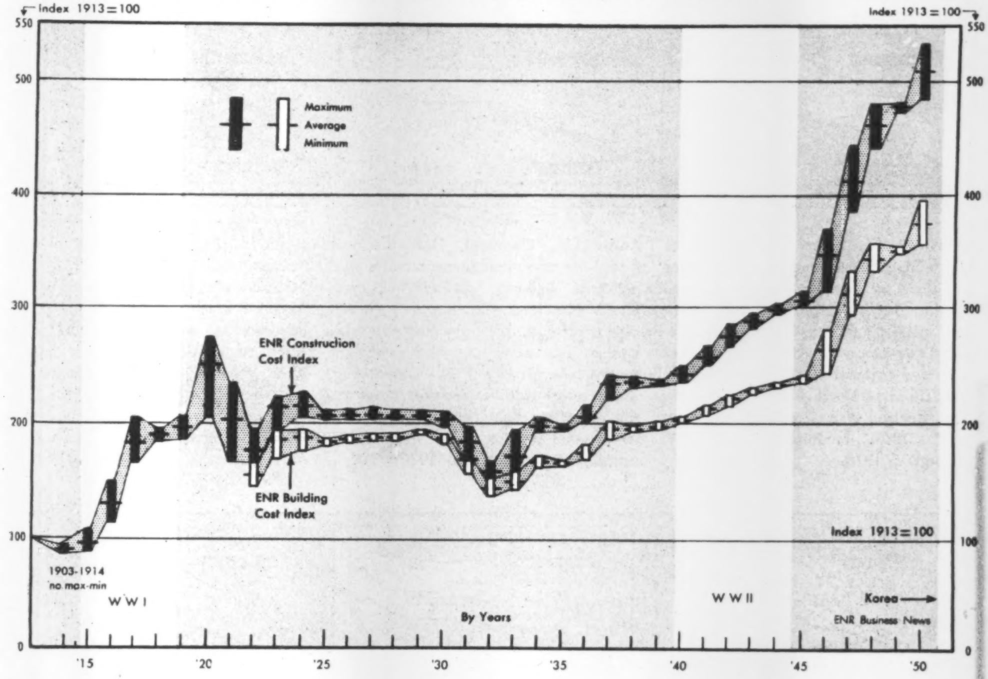
# Engineering News-Record Construction and Building Cost Indexes



## Index base conversion table

To change base years for Engineering News-Record Construction and Building Cost Indexes, divide by following conversion factors:

| To convert From Base 1913=100 to Base below: | Divide 1913=100 values for Construction Cost Index by | Divide 1913=100 values for Building Cost Index by |
|---|---|---|
| 1949=100 | 4.7702 | 3.5179 |
| 1940=100 | 2.4196 | 2.0281 |
| 1939=100 | 2.3551 | 1.9744 |
| 1926=100 | 2.0803 | 1.8499 |
| 1925-29=100 | 2.0695 | 1.8648 |
| 1929=100 | 2.0702 | 1.9086 |
| 1910-14=100 | 0.9380 | 0.9477 |
| 1924=100 | 2.1536 | 1.8578 |
| 1923-25=100 | 2.1204 | 1.8481 |
| 1914=100 | 0.8856 | 0.9191 |
| 1911=100 | 0.9343 | 0.9414 |

THE ENGINEERING NEWS-RECORD Construction and Building Cost Indexes reflect wage rate and material price trends. They do not adjust for labor efficiency, materials availability, competitive conditions, management, mechanization or other "intangibles" affecting construction costs.

A hypothetical block of construction requiring 6 bbls of cement, 1.088 M ft bm of lumber, 2,500 lbs of steel and 200 hours of common labor is used to measure the trend of the cost of heavy construction.

The building cost index is based on a similar hypothetical block using the same quantities of materials, but 68.38 hours of skilled labor.

This simple structure was adopted to facilitate prompt reporting of changes due to price and wage rate movements, both as to direction and degree.

Both indexes have proved, over the years, infallible as to direction and, in normal times, remarkably accurate as to degree. Under abnormal conditions of increasing or decreasing job productivity, allowance for the "intangibles" listed above should be made in measuring the degree of change in overall completion costs, or of construction selling price.

## History and use of ENR Cost Indexes

The ENGINEERING NEWS-RECORD Construction Cost Index was established in 1921, based on structural steel, portland cement, lumber and common labor. The ENR Building Cost index was added in 1938 to measure the effect of skilled wage trends on costs. It uses the same materials as those in the construction cost index but skilled labor, instead of common labor. A few minor changes have been made in these indexes over the years necessitated by changed conditions in the market. These are recorded in full, together with a complete history of the development and use of these indexes, in ENR, September 1, 1949, page 398.

New values are reported at the beginning of each month, based on 1913 = 100. These are weighted aggregative indexes, so base years can be shifted at will. Conversion factors and values of these indexes are shown in the accompanying tables using years 1926, 1939 and 1940 as bases.

## ENR Cost Indexes

Converted to other bases

| Year | Construction '26=100 | Construction '39=100 | Construction '40=100 | Building '26=100 | Building '39=100 | Building '40=100 |
|---|---|---|---|---|---|---|
| 1926 | 100.0 | 88.3 | 85.9 | 100.0 | 93.6 | 91.2 |
| 1928 | 99.4 | 87.8 | 85.4 | 101.6 | 95.2 | 92.6 |
| 1929 | 99.5 | 87.9 | 85.5 | 103.1 | 96.6 | 94.1 |
| 1930 | 97.5 | 86.1 | 83.8 | 100.2 | 93.9 | 91.4 |
| 1931 | 87.1 | 77.0 | 74.9 | 91.3 | 85.7 | 83.5 |
| 1932 | 75.4 | 66.6 | 64.8 | 75.7 | 71.3 | 69.4 |
| 1933 | 81.8 | 72.2 | 70.3 | 79.5 | 74.8 | 72.8 |
| 1939 | 113.2 | 100.0 | 97.3 | 106.7 | 100.0 | 97.3 |
| 1940 | 116.3 | 162.7 | 100.0 | 109.6 | 102.7 | 100.0 |
| 1941 | 124.0 | 109.4 | 106.5 | 114.3 | 107.1 | 104.2 |
| 1942 | 132.8 | 117.3 | 114.1 | 120.2 | 112.6 | 109.6 |
| 1945 | 147.9 | 130.6 | 127.2 | 129.3 | 121.1 | 117.8 |
| 1946 | 166.3 | 146.9 | 143.0 | 141.8 | 132.9 | 129.4 |
| 1947 | 198.6 | 175.4 | 170.8 | 169.2 | 158.5 | 154.3 |
| 1948 | 221.5 | 195.6 | 190.4 | 186.2 | 174.5 | 169.9 |
| 1949 | 229.3 | 202.5 | 197.1 | 190.2 | 178.2 | 173.4 |
| 1950 | 244.7 | 216.2 | 210.4 | 202.8 | 190.0 | 185.0 |

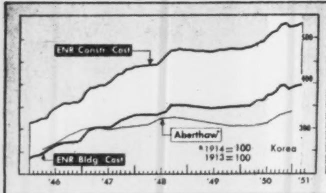
## Building cost indexes—yearly averages, 1913 = 100

| WEIGHTED | Orig. Base | 1926 | 1932 | 1939 | 1942 | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENR Construction | 1913=100 | 208 | 157 | 236 | 276 | 308 | 346 | 413 | 461 | 477 | 509 | 538 Mar. |
| ENR Building | 1913=100 | 185 | 141 | 197 | 222 | 239 | 262 | 313 | 345 | 352 | 375 | 398 Mar. |
| American Appraisal* | 1913=100 | 217 | 155 | 200 | 241 | 271 | 322 | 430 | 490 | 490 | 500 | ........ |
| Assoc. Gen. Contr | 1913=100 | 197 | 171 | 188 | 209 | 231 | 257 | 296 | 332 | 342 | 357 | 374 Jan. |
| Boeckh, U. S. aver | 1926-29=100 | 181 | 144 | 191 | 214 | 252 | 275 | 323 | 365 | 369 | 386 | 408 Jan. |
| Marshall & Stevens | 1926=100 | 185 | 130 | 183 | 218 | 248 | 288 | 338 | 368 | 365 | 390 | ........ |
| Smith, Hinchman & Grylls* | 1926=100 | 185 | 128 | 199 | 226 | 285 | 319 | 371 | 405 | 395 | 426 | 467 Feb. |
| ICCRR Sta & Off Bldgs | 1910-14=100† | 184 | 141 | 166 | 227 | 244 | 291 | 333 | 364 | 368 | ... | ........ |
| WR & A—RC Bldg Pac Div | 1911-14=100† | 191 | 153 | 192 | 240 | 248 | 273 | 336 | 393 | 416 | 426 | 458 |
| **CONTRACTOR** | **Orig. Base** | **1926** | **1932** | **1939** | **1942** | **1945** | **1946** | **1947** | **1948** | **1949** | **1950** | **1951** |
| Aberthaw | 1914=100† | 197 | 168 | 190 | 223 | 236 | 279 | 304 | 321 | 312 | 321 | ........ |
| Austin | 1926=100 | 185 | 117 | 152 | 213 | 234 | 273 | 301 | 317 | 307 | 313 | ........ |
| Fruin-Colnon | 1926=100 | 218 | 178 | 208 | 227 | 247 | 285 | 347 | 382 | 382 | 398 | ........ |
| Fuller | 1913=100 | 202 | 157 | 195 | 229 | 241 | 290 | 354 | 380 | 382 | 377 | 398 Jan. |
| Turner | 1913=100 | 195 | 136 | 182 | 245 | 263 | 318 | 380 | 422 | 414 | 427 | 470 Feb. |

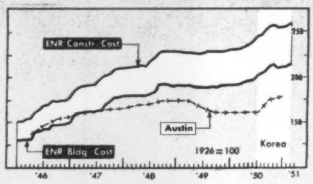
* Correct for productivity.

† Not converted to 1913=100.

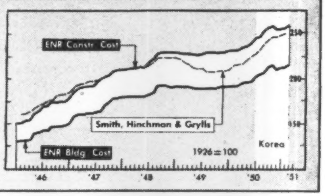
# Building cost indexes defined and compared



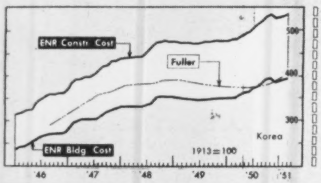
**Aberthaw Co., Boston, Mass.**—Since March 31, 1946, a composite of 36 major cost items in three multi-story and two one-story New England industrial buildings, including all mechanical trades. Repriced quarterly using actual and estimated labor and material costs. Base: 1914 = 100. (Prior to March 31, 1946, based on New England seven-story and basement, 62′4″ x 202′4″, reinforced concrete building built in 1914.



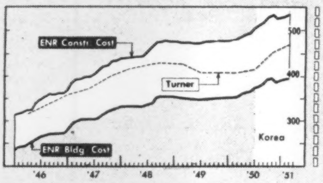
**Austin Co., Cleveland, Ohio.**—Reprices typical one-story, steel frame, monitor type industrial building. Includes concrete foundations; brick curtain walls; continuous steel sash; concrete floor laid on ground; 2-in. wood roof deck on timber purlins covered with 4-ply waterproofing, monitor sash with mechanical operators, but no heating, lighting, plumbing, sprinkler or other services. Priced quarterly for central and eastern states. 1926 = 100.



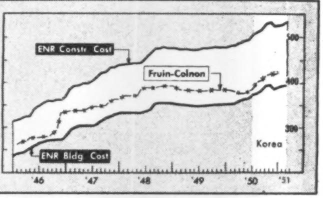
**Smith Hinchman & Grylls, Inc., Detroit, Mich.**—Actual in-place costs, using building material costs, freight rates, skilled and unskilled labor rates and including labor efficiency and premiums, bidding competition, contractor profit margins and overhead. Figured with the contractor overhead are taxes, duration of projects, material expediting and labor procurement. This index, is reported monthly on a 1926 = 100 base.



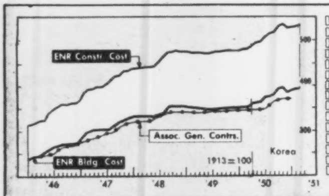
**George A. Fuller Co., New York, N. Y.**—Composite of 36 major cost elements, in three commercial type buildings, including mechanicals, elevators, wiring, heating and ventilating, repriced.



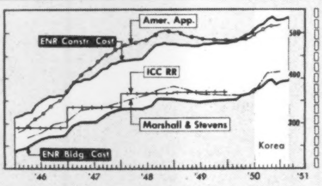
**Turner Construction Co., New York, N. Y.**—Eastern cities. Own cost experience on labor rates, material prices, productivity of labor, efficiency of plant, competitive conditions, forecast of price trends.



**Fruin-Colnon Contracting Co., St. Louis, Mo.**—Industrial plant of five buildings in St. Louis repriced monthly on basis of contractor's actual and estimated material and labor costs.



**Associated General Contractors of America** (AGC), Washington, D. C.—Wages and materials for 12 cities combined in 40-60 ratio. Wages, prevailing rates for hod carriers and common labor. Materials, weighted: sand, gravel and crushed stone, 1; cement, 1; lumber, 1; hollow tile, ½; structural and reinforcing steel, ½.

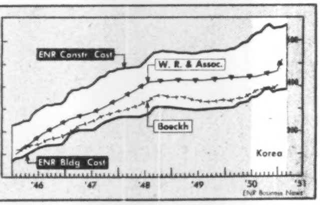


Additional building cost indexes are defined and reported in detail in the accompanying pages. These include:

**American Appraisal Co.**, Milwaukee, Wisc.

**ICC Railroad**—Sta & Off Bldgs.

**Marshall & Stevens**, Chicago, Ill.



**Whitman, Requardt & Associates**, Baltimore, Md.— Reinf. Concr. Bldg., Pacific Div.

**E. H. Boeckh & Assoc.**—National average composite industrial building used in charts, not shown in detail in accompanying tables.

**Tables on the preceding page show values for selected years of the indexes shown in the above charts. These have been converted to 1913=100 to make them more readily comparable with each other. In the following pages are tables for these cost indexes: • American Appraisal Co., for 22 cities; • Marshall & Stevens, for 14 classes of industrial equipment; • ICC RR Road construction cost trends for 32 classes of construction; • Whitman, Requardt & Assoc., selected utility cost trends in 5 regions; • E. H. Boeckh & Assoc., indexes for 10 kinds of buildings in 22 cities.**

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Klemp Diamond OPEN STEEL BRIDGE DECKING
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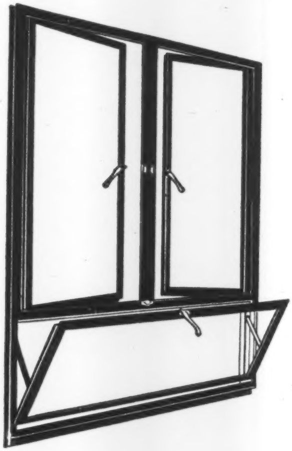

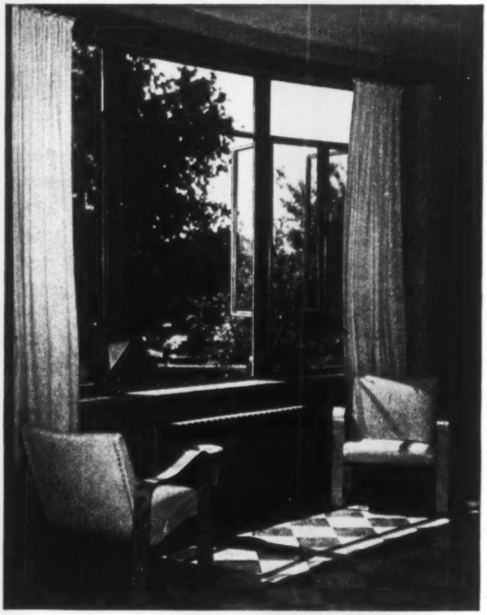

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*Chas. H. Shook, Inc., Contractor*

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*Subsidiary of Republic Steel Corporation*

# Boeckh index of building costs—U S average 1926-'29=100

| Annual Averages By Cities | Residences | | Apartments, Hotels, Office Bldgs. | | | Commercial & Factory Bldgs. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Brick and | | | | | Brick and | | |
| | Frame | Brick | Wood | Conc. | Steel | Frame | Steel | Wood | Steel | Conc. |
| **U. S. AVERAGE** | | | | | | | | | | |
| 1926–29 | 101.4 | 102.5 | 102.5 | 102.8 | 101.3 | 102.2 | 100.8 | 101.7 | 102.2 | 104.6 |
| 1939 | 101.2 | 104.4 | 104.1 | 111.2 | 109.4 | 101.3 | 110.4 | 105.0 | 112.1 | 113.3 |
| 1946 | 161.8 | 161.9 | 161.7 | 154.0 | 154.8 | 165.6 | 145.0 | 158.7 | 154.8 | 156.0 |
| 1948 | 221.4 | 219.2 | 218.9 | 201.0 | 204.0 | 228.1 | 188.1 | 212.3 | 202.2 | 203.8 |
| 1949 | 213.8 | 215.6 | 215.0 | 208.1 | 208.4 | 218.4 | 195.5 | 211.9 | 208.7 | 211.4 |
| 1950 | 225.9 | 227.1 | 226.7 | 216.5 | 217.0 | 231.3 | 203.2 | 222.2 | 217.4 | 218.8 |
| Dec. '50 | 236.1 | 237.4 | 236.9 | 224.7 | 226.4 | 241.3 | 211.0 | 232.4 | 225.9 | 226.3 |
| **ATLANTA AREA** | | | | | | | | | | |
| 1926–29 | 82.7 | 87.0 | 84.2 | 83.7 | 87.0 | 82.9 | 94.5 | 84.7 | 87.5 | 86.8 |
| 1939 | 82.8 | 86.0 | 86.1 | 95.1 | 95.0 | 80.6 | 96.2 | 88.6 | 94.6 | 97.4 |
| 1946 | 149.2 | 148.1 | 148.2 | 136.8 | 139.9 | 151.7 | 130.0 | 146.8 | 135.1 | 136.4 |
| 1948 | 202.5 | 199.2 | 199.5 | 178.8 | 186.8 | 205.2 | 173.0 | 193.1 | 178.8 | 178.8 |
| 1949 | 189.9 | 189.3 | 189.3 | 180.6 | 185.4 | 191.7 | 172.7 | 186.5 | 177.5 | 180.8 |
| 1950 | 196.2 | 194.3 | 194.7 | 185.4 | 191.0 | 199.3 | 183.0 | 190.0 | 185.0 | 183.7 |
| Dec. '50 | 208.0 | 205.4 | 205.7 | 195.3 | 200.5 | 211.2 | 193.3 | 200.0 | 195.3 | 192.0 |
| **BALTIMORE AREA** | | | | | | | | | | |
| 1926–29 | 107.2 | 112.0 | 107.6 | 100.6 | 100.7 | 106.3 | 95.5 | 106.8 | 96.8 | 101.2 |
| 1939 | 93.5 | 95.5 | 95.6 | 99.3 | 99.2 | 94.0 | 101.7 | 96.6 | 101.4 | 100.2 |
| 1946 | 163.1 | 161.7 | 162.2 | 149.1 | 150.8 | 167.6 | 138.9 | 158.8 | 150.0 | 148.2 |
| 1948 | 221.5 | 219.5 | 219.8 | 196.0 | 199.7 | 227.0 | 181.7 | 215.6 | 197.1 | 199.0 |
| 1949 | 216.4 | 217.4 | 217.3 | 204.5 | 204.8 | 220.5 | 191.8 | 216.6 | 204.6 | 208.5 |
| 1950 | 231.0 | 231.8 | 232.1 | 215.0 | 216.8 | 234.9 | 204.2 | 230.6 | 217.7 | 216.5 |
| Dec. '50 | 240.6 | 241.8 | 242.3 | 222.2 | 225.6 | 244.2 | 212.1 | 241.1 | 225.9 | 223.1 |
| **BIRMINGHAM AREA** | | | | | | | | | | |
| 1926–29 | 91.7 | 96.7 | 94.1 | 95.5 | 96.8 | 90.2 | 97.5 | 94.6 | 96.3 | 96.3 |
| 1939 | 87.8 | 90.9 | 91.5 | 96.1 | 96.2 | 84.9 | 96.9 | 95.1 | 95.6 | 96.3 |
| 1946 | 149.3 | 147.4 | 147.9 | 137.3 | 139.4 | 149.7 | 128.1 | 145.4 | 135.2 | 137.4 |
| 1948 | 199.9 | 195.1 | 195.2 | 174.4 | 180.5 | 205.6 | 171.3 | 187.6 | 175.5 | 175.3 |
| 1949 | 188.2 | 187.2 | 187.6 | 178.9 | 182.0 | 192.8 | 172.6 | 183.7 | 177.7 | 180.0 |
| 1950 | 196.3 | 196.1 | 196.8 | 186.6 | 189.4 | 200.6 | 179.2 | 193.9 | 186.2 | 187.6 |
| Dec. '50 | 208.6 | 208.0 | 207.9 | 196.4 | 200.1 | 212.1 | 187.2 | 205.1 | 195.5 | 197.4 |
| **BOSTON AREA** | | | | | | | | | | |
| 1926–29 | 116.3 | 120.3 | 115.4 | 106.2 | 107.0 | 118.8 | 106.3 | 112.5 | 108.7 | 105.8 |
| 1939 | 106.2 | 110.4 | 110.1 | 116.3 | 113.7 | 105.7 | 114.2 | 111.5 | 118.2 | 118.5 |
| 1946 | 167.0 | 166.5 | 166.0 | 156.8 | 156.6 | 172.1 | 147.1 | 161.1 | 158.5 | 160.4 |
| 1948 | 227.5 | 226.2 | 225.6 | 205.3 | 207.7 | 234.7 | 190.0 | 218.8 | 207.1 | 209.7 |
| 1949 | 223.0 | 226.5 | 225.9 | 216.7 | 215.6 | 227.1 | 201.3 | 222.9 | 218.2 | 221.9 |
| 1950 | 234.6 | 240.8 | 236.8 | 227.3 | 225.5 | 240.3 | 210.9 | 231.8 | 229.8 | 232.5 |
| Dec. '50 | 244.8 | 248.0 | 247.2 | 236.5 | 236.0 | 250.9 | 219.3 | 242.0 | 239.6 | 241.2 |
| **CHICAGO AREA** | | | | | | | | | | |
| 1926–29 | 109.2 | 114.2 | 109.8 | 113.2 | 109.1 | 112.9 | 105.2 | 105.9 | 112.0 | 116.0 |
| 1939 | 110.6 | 112.5 | 111.1 | 123.6 | 118.7 | 114.2 | 117.6 | 109.3 | 122.6 | 127.6 |
| 1946 | 168.3 | 166.0 | 164.2 | 158.9 | 156.9 | 168.1 | 144.5 | 157.4 | 157.0 | 162.5 |
| 1948 | 224.5 | 219.9 | 217.5 | 201.7 | 202.0 | 235.8 | 183.2 | 206.4 | 201.1 | 205.9 |
| 1949 | 219.2 | 218.3 | 216.1 | 210.6 | 208.7 | 229.1 | 193.3 | 207.7 | 210.4 | 215.1 |
| 1950 | 231.9 | 229.7 | 227.4 | 217.8 | 216.8 | 243.4 | 201.2 | 216.5 | 219.5 | 222.6 |
| Dec. '50 | 241.2 | 238.5 | 236.2 | 226.5 | 225.8 | 252.7 | 208.5 | 224.2 | 226.7 | 229.4 |
| **CINCINNATI AREA** | | | | | | | | | | |
| 1926–29 | 100.5 | 105.0 | 101.3 | 101.0 | 100.2 | 100.2 | 99.6 | 103.1 | 100.6 | 101.0 |
| 1939 | 103.3 | 106.2 | 105.9 | 113.9 | 110.4 | 103.3 | 111.7 | 107.1 | 113.7 | 116.5 |
| 1946 | 165.6 | 166.8 | 166.7 | 154.5 | 154.7 | 167.5 | 140.7 | 166.4 | 154.4 | 156.1 |
| 1948 | 222.6 | 222.0 | 221.2 | 201.5 | 202.5 | 227.6 | 184.8 | 217.5 | 201.9 | 205.7 |
| 1949 | 214.1 | 216.6 | 215.8 | 207.5 | 206.0 | 217.9 | 193.5 | 214.1 | 208.4 | 212.2 |
| 1950 | 220.3 | 224.1 | 223.1 | 213.9 | 211.7 | 224.3 | 199.1 | 220.4 | 215.6 | 218.7 |
| Dec. '50 | 229.7 | 234.4 | 233.2 | 221.2 | 219.6 | 233.3 | 204.6 | 233.2 | 222.7 | 226.1 |
| **CLEVELAND AREA** | | | | | | | | | | |
| 1926–29 | 107.2 | 113.4 | 108.5 | 111.3 | 108.3 | 109.0 | 103.0 | 107.2 | 110.5 | 114.8 |
| 1939 | 106.2 | 109.6 | 109.5 | 115.3 | 112.8 | 107.5 | 112.9 | 109.5 | 117.7 | 118.0 |
| 1946 | 169.2 | 169.4 | 168.7 | 160.2 | 159.9 | 174.1 | 146.4 | 164.3 | 161.0 | 165.9 |
| 1948 | 229.8 | 228.2 | 226.4 | 209.4 | 208.7 | 238.7 | 190.5 | 219.6 | 210.9 | 214.5 |
| 1949 | 224.8 | 225.7 | 223.6 | 216.0 | 213.0 | 233.0 | 198.5 | 218.0 | 217.2 | 220.9 |
| 1950 | 237.9 | 237.8 | 235.4 | 227.8 | 224.1 | 248.1 | 207.2 | 227.6 | 228.4 | 232.3 |
| Dec. '50 | 247.2 | 247.3 | 245.1 | 235.5 | 233.2 | 257.0 | 216.2 | 237.8 | 237.2 | 239.3 |
| **DALLAS AREA** | | | | | | | | | | |
| 1926–29 | 103.1 | 107.3 | 103.2 | 98.9 | 99.1 | 103.6 | 100.5 | 100.9 | 99.4 | 99.7 |
| 1939 | 95.1 | 95.8 | 96.7 | 98.8 | 100.2 | 94.8 | 106.6 | 96.0 | 101.9 | 98.9 |
| 1946 | 150.2 | 148.8 | 149.4 | 139.8 | 144.4 | 153.5 | 140.3 | 144.6 | 142.5 | 141.1 |
| 1948 | 214.5 | 207.5 | 207.9 | 186.1 | 193.9 | 224.4 | 185.4 | 197.9 | 189.0 | 184.0 |
| 1949 | 207.2 | 206.2 | 206.9 | 197.1 | 201.3 | 210.3 | 197.1 | 203.2 | 201.5 | 195.4 |
| 1950 | 220.5 | 221.2 | 222.1 | 209.0 | 212.5 | 221.3 | 206.3 | 218.6 | 210.1 | 208.3 |
| Dec. '50 | 232.1 | 232.0 | 232.6 | 219.3 | 224.2 | 234.3 | 217.6 | 227.8 | 221.0 | 217.8 |
| **DENVER AREA** | | | | | | | | | | |
| 1926–29 | 95.0 | 99.7 | 95.5 | 102.4 | 99.6 | 95.5 | 105.5 | 94.6 | 101.4 | 108.0 |
| 1939 | 112.1 | 112.0 | 111.2 | 116.1 | 114.4 | 114.3 | 118.7 | 109.5 | 117.0 | 117.8 |
| 1946 | 160.1 | 160.3 | 150.4 | 155.3 | 157.9 | 164.0 | 155.6 | 156.8 | 160.0 | 158.3 |
| 1948 | 218.1 | 217.8 | 217.7 | 202.7 | 206.2 | 223.0 | 197.9 | 213.6 | 206.7 | 207.0 |
| 1949 | 212.9 | 215.8 | 215.9 | 211.0 | 213.1 | 216.2 | 207.0 | 214.3 | 214.6 | 215.3 |
| 1950 | 228.2 | 230.0 | 229.8 | 218.8 | 221.2 | 232.4 | 212.3 | 226.2 | 221.2 | 221.3 |
| Dec. '50 | 243.2 | 246.0 | 245.8 | 230.6 | 233.9 | 245.7 | 219.6 | 243.5 | 232.4 | 231.1 |
| **DETROIT AREA** | | | | | | | | | | |
| 1926–29 | 103.3 | 108.4 | 104.3 | 102.9 | 102.4 | 103.7 | 103.1 | 103.5 | 103.3 | 104.4 |
| 1939 | 98.8 | 102.7 | 102.9 | 108.6 | 107.5 | 98.7 | 108.8 | 104.2 | 111.4 | 110.1 |
| 1946 | 165.9 | 165.9 | 165.8 | 157.4 | 157.9 | 171.3 | 147.5 | 160.9 | 160.0 | 159.7 |
| 1948 | 224.7 | 223.4 | 223.0 | 203.8 | 205.1 | 231.5 | 187.9 | 215.9 | 206.5 | 207.2 |
| 1949 | 221.0 | 222.6 | 221.9 | 212.2 | 211.5 | 227.0 | 196.8 | 216.8 | 214.2 | 215.9 |
| 1950 | 233.0 | 234.0 | 233.3 | 222.8 | 222.0 | 240.0 | 208.2 | 227.1 | 226.0 | 225.7 |
| Dec. '50 | 242.6 | 243.6 | 242.6 | 230.5 | 230.5 | 249.7 | 213.8 | 236.5 | 232.5 | 233.0 |
| **KANSAS CITY AREA** | | | | | | | | | | |
| 1926–29 | 100.3 | 106.5 | 102.2 | 105.7 | 103.3 | 101.1 | 105.9 | 101.9 | 107.5 | 108.8 |
| 1939 | 104.4 | 109.9 | 109.8 | 118.3 | 115.4 | 103.8 | 117.2 | 113.0 | 120.0 | 121.6 |
| 1946 | 166.5 | 165.6 | 165.4 | 158.2 | 159.5 | 172.3 | 151.0 | 159.8 | 159.3 | 160.3 |
| 1948 | 227.6 | 224.3 | 224.4 | 203.9 | 209.0 | 235.9 | 195.5 | 214.9 | 208.2 | 206.2 |
| 1949 | 215.9 | 216.7 | 216.3 | 209.0 | 211.1 | 221.8 | 199.4 | 210.0 | 211.3 | 211.5 |
| 1950 | 230.5 | 229.6 | 228.7 | 216.0 | 218.8 | 238.1 | 203.6 | 219.6 | 217.7 | 217.8 |
| Dec. '50 | 241.5 | 242.3 | 241.6 | 226.0 | 229.6 | 247.4 | 212.6 | 234.8 | 228.4 | 227.5 |
| **LOS ANGELES AREA** | | | | | | | | | | |
| 1926–29 | 92.7 | 97.9 | 93.5 | 98.8 | 96.8 | 93.5 | 97.0 | 91.3 | 97.5 | 103.1 |
| 1939 | 93.6 | 97.2 | 97.5 | 103.7 | 105.0 | 95.6 | 109.5 | 96.8 | 106.2 | 104.9 |
| 1946 | 155.1 | 156.1 | 156.2 | 155.3 | 156.7 | 160.1 | 158.3 | 150.9 | 160.0 | 158.7 |
| 1948 | 216.5 | 215.9 | 215.7 | 205.8 | 209.5 | 223.0 | 199.7 | 208.2 | 209.8 | 210.0 |
| 1949 | 203.2 | 207.0 | 206.0 | 209.9 | 210.7 | 205.3 | 201.2 | 201.8 | 210.2 | 212.4 |
| 1950 | 222.8 | 224.1 | 223.4 | 217.4 | 219.2 | 227.8 | 205.5 | 215.4 | 217.5 | 219.0 |
| Dec. '50 | 231.9 | 233.1 | 232.4 | 225.3 | 228.6 | 237.2 | 214.8 | 224.5 | 226.4 | 226.4 |
| **MINNEAPOLIS AREA** | | | | | | | | | | |
| 1926–29 | 92.8 | 98.2 | 94.6 | 95.6 | 96.1 | 92.8 | 100.0 | 93.9 | 97.9 | 98.4 |
| 1939 | 101.9 | 105.0 | 104.2 | 113.5 | 110.7 | 102.7 | 113.4 | 103.6 | 114.5 | 117.2 |
| 1946 | 163.7 | 167.6 | 167.5 | 156.5 | 155.7 | 164.9 | 142.6 | 168.2 | 157.2 | 159.5 |
| 1948 | 223.3 | 222.1 | 221.6 | 200.8 | 203.9 | 229.0 | 186.2 | 214.9 | 201.5 | 204.9 |
| 1949 | 218.7 | 218.7 | 217.7 | 205.1 | 206.9 | 224.4 | 192.6 | 211.7 | 205.8 | 208.0 |
| 1950 | 228.2 | 227.9 | 227.0 | 210.1 | 213.2 | 234.4 | 198.2 | 220.3 | 215.6 | 211.3 |
| Dec. '50 | 236.8 | 236.2 | 235.6 | 215.9 | 220.9 | 242.9 | 205.3 | 228.7 | 219.3 | 216.1 |
| **NEW ORLEANS AREA** | | | | | | | | | | |
| 1926–29 | 93.3 | 96.3 | 93.4 | 86.5 | 90.6 | 93.3 | 93.7 | 91.5 | 89.5 | 86.5 |
| 1939 | 89.0 | 90.3 | 91.3 | 95.4 | 98.3 | 88.1 | 102.8 | 91.7 | 98.5 | 94.9 |
| 1946 | 148.9 | 147.4 | 148.2 | 138.6 | 142.8 | 151.2 | 138.7 | 145.4 | 142.0 | 138.7 |
| 1948 | 204.5 | 200.3 | 200.5 | 177.2 | 184.9 | 209.5 | 170.7 | 194.3 | 178.7 | 176.9 |
| 1949 | 201.6 | 201.4 | 202.0 | 188.8 | 194.6 | 204.9 | 186.0 | 200.0 | 191.8 | 189.8 |
| 1950 | 211.7 | 210.3 | 211.0 | 196.2 | 203.1 | 215.8 | 194.4 | 206.4 | 199.5 | 195.3 |
| Dec. '50 | 221.4 | 219.2 | 219.8 | 203.2 | 210.9 | 226.3 | 201.3 | 214.1 | 206.3 | 201.4 |
| **NEW YORK CITY AREA** | | | | | | | | | | |
| 1926–29 | 133.3 | 138.4 | 131.9 | 122.8 | 120.4 | 137.5 | 113.1 | 127.4 | 123.2 | 125.3 |
| 1939 | 122.1 | 123.3 | 122.5 | 130.6 | 125.9 | 125.6 | 123.7 | 119.6 | 130.0 | 133.3 |
| 1946 | 182.4 | 181.8 | 181.1 | 177.2 | 174.6 | 188.1 | 158.6 | 177.4 | 174.8 | 179.0 |
| 1948 | 251.6 | 250.1 | 249.0 | 239.4 | 236.8 | 260.5 | 212.2 | 240.7 | 236.5 | 242.2 |
| 1949 | 240.8 | 243.7 | 242.7 | 242.8 | 238.2 | 247.5 | 217.3 | 238.3 | 240.0 | 246.4 |
| 1950 | 254.5 | 256.2 | 255.2 | 249.5 | 246.1 | 262.1 | 224.2 | 249.7 | 248.0 | 251.5 |
| Dec. '50 | 266.5 | 268.1 | 267.1 | 258.5 | 255.9 | 273.6 | 232.1 | 261.3 | 257.2 | 259.0 |
| **PHILADELPHIA AREA** | | | | | | | | | | |
| 1926–29 | 100.3 | 106.3 | 103.7 | 105.9 | 103.1 | 98.1 | 101.9 | 104.2 | 104.1 | 107.5 |
| 1939 | 99.2 | 102.6 | 102.9 | 105.7 | 104.1 | 98.2 | 102.0 | 105.0 | 105.5 | 106.7 |
| 1946 | 165.0 | 163.9 | 164.9 | 153.2 | 154.6 | 160.0 | 141.2 | 161.1 | 152.7 | 154.0 |
| 1948 | 224.5 | 220.3 | 220.1 | 197.9 | 201.8 | 230.5 | 181.0 | 212.5 | 196.1 | 198.1 |
| 1949 | 220.5 | 220.6 | 220.3 | 209.0 | 209.0 | 224.3 | 190.3 | 216.3 | 205.6 | 209.9 |
| 1950 | 234.4 | 235.1 | 234.8 | 221.2 | 220.7 | 239.3 | 202.0 | 230.5 | 218.8 | 222.8 |
| Dec. '50 | 244.8 | 246.1 | 246.0 | 230.4 | 230.9 | 248.6 | 211.4 | 243.0 | 229.0 | 231.7 |
| **PITTSBURGH AREA** | | | | | | | | | | |
| 1926–29 | 113.3 | 118.8 | 112.8 | 111.2 | 107.1 | 115.4 | 89.6 | 112.2 | 104.6 | 112.9 |
| 1939 | 113.8 | 117.0 | 115.7 | 117.5 | 114.2 | 114.2 | 109.8 | 116.5 | 116.9 | 119.1 |
| 1946 | 169.5 | 169.0 | 168.0 | 156.6 | 155.3 | 173.5 | 140.1 | 166.4 | 153.2 | 158.9 |
| 1948 | 235.2 | 231.2 | 229.6 | 207.3 | 207.9 | 243.0 | 183.2 | 222.2 | 208.5 | 210.1 |
| 1949 | 227.1 | 229.1 | 227.7 | 215.6 | 212.2 | 231.3 | 186.9 | 227.0 | 209.8 | 219.8 |
| 1950 | 237.6 | 238.6 | 237.6 | 222.2 | 219.8 | 242.6 | 196.6 | 235.3 | 218.9 | 224.2 |
| Dec. '50 | 246.2 | 246.3 | 245.4 | 228.8 | 228.3 | 252.0 | 204.1 | 241.4 | 226.4 | 229.4 |
| **ST. LOUIS AREA** | | | | | | | | | | |
| 1926–29 | 118.6 | 121.1 | 115.7 | 109.9 | 108.8 | 121.3 | 103.3 | 111.7 | 107.7 | 109.3 |
| 1939 | 107.0 | 110.2 | 109.9 | 118.7 | 116.4 | 107.6 | 114.3 | 110.3 | 119.2 | 119.8 |
| 1946 | 167.4 | 167.1 | 166.2 | 159.1 | 158.9 | 171.7 | 145.3 | 154.8 | 158.1 | 161.1 |
| 1948 | 231.2 | 227.9 | 227.2 | 207.7 | 210.3 | 239.7 | 190.0 | 220.3 | 208.1 | 210.0 |
| 1949 | 220.7 | 221.4 | 220.7 | 212.8 | 212.4 | 226.8 | 197.5 | 217.3 | 213.6 | 215.7 |
| 1950 | 230.7 | 232.8 | 233.7 | 221.9 | 220.9 | 240.1 | 204.7 | 229.5 | 222.8 | 225.3 |
| Dec. '50 | 239.7 | 243.0 | 244.6 | 229.9 | 229.5 | 249.6 | 210.2 | 241.1 | 229.9 | 233.3 |
| **SAN FRANCISCO AREA** | | | | | | | | | | |
| 1926–29 | 87.7 | 93.7 | 90.4 | 97.5 | 96.5 | 86.1 | 95.5 | 91.8 | 95.9 | 99.0 |
| 1939 | 99.2 | 105.7 | 104.5 | 117.4 | 114.4 | 97.6 | 114.9 | 107.4 | 116.5 | 121.9 |
| 1946 | 157.5 | 159.7 | 160.0 | 157.9 | 159.0 | 160.5 | 151.5 | 158.4 | 160.0 | 159.3 |
| 1948 | 216.6 | 218.9 | 218.7 | 208.3 | 210.3 | 222.2 | 196.9 | 216.9 | 211.2 | 214.7 |
| 1949 | 207.1 | 213.0 | 212.8 | 214.0 | 213.9 | 210.0 | 203.9 | 213.9 | 216.1 | 219.8 |
| 1950 | 223.1 | 227.0 | 226.8 | 222.4 | 222.9 | 226.1 | 209.1 | 224.5 | 222.6 | 224.5 |
| Dec. '50 | 232.0 | 235.2 | 234.9 | 228.4 | 230.5 | 235.4 | 215.8 | 232.0 | 228.9 | 229.5 |
| **SEATTLE AREA** | | | | | | | | | | |
| 1926–29 | 84.5 | 92.2 | 89.2 | 101.7 | 95.1 | 82.4 | 100.8 | 92.2 | 100.5 | 105.9 |
| 1939 | 96.7 | 104.4 | 103.8 | 119.2 | 114.9 | 94.4 | 115.1 | 108.3 | 118.7 | 125.3 |
| 1946 | 152.9 | 158.3 | 157.9 | 161.2 | 159.8 | 154.3 | 156.0 | 158.9 | 164.2 | 167.1 |
| 1948 | 211.4 | 216.3 | 216.6 | 211.5 | 212.6 | 214.5 | 200.9 | 215.6 | 216.9 | 216.6 |
| 1949 | 203.9 | 214.2 | 214.0 | 220.7 | 218.1 | 205.2 | 209.9 | 218.0 | 225.3 | 228.5 |
| 1950 | 213.6 | 224.1 | 224.0 | 227.1 | 224.7 | 214.3 | 214.1 | 227.8 | 230.3 | 234.5 |
| Dec. '50 | 222.3 | 232.5 | 232.6 | 234.3 | 233.3 | 222.2 | 220.1 | 235.4 | 236.8 | 240.3 |
| **WASHINGTON, D. C.** | | | | | | | | | | |
| 1926–29 | 106.6 | 107.7 | 107.9 | 107.1 | 105.9 | 106.0 | 104.0 | 108.0 | 106.4 | 108.4 |
| 1946 | 168.5 | 166.2 | 167.1 | 157.1 | 158.2 | 173.6 | 145.2 | 162.6 | 157.2 | 156.6 |
| 1948 | 225.3 | 221.2 | 221.2 | 199.7 | 203.2 | 231.8 | 186.0 | 213.0 | 200.1 | 199.5 |
| 1949 | 223.1 | 223.3 | 223.1 | 213.5 | 212.6 | 227.2 | 194.8 | 218.6 | 210.4 | 214.6 |
| 1950 | 235.0 | 233.7 | 233.8 | 223.2 | 224.5 | 240.5 | 210.2 | 227.5 | 223.8 | 222.0 |
| Dec. '50 | 246.6 | 244.2 | 244.5 | 229.6 | 232.7 | 252.5 | 216.1 | 237.2 | 230.3 | 227.3 |

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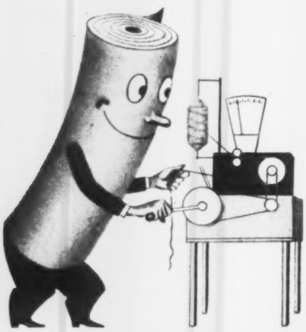
Current indexes are calculated upon an actual survey at source of local construction cost conditions. Material prices used are those paid by contractors to material dealers. Labor rates are current rates paid by contractors — certain corrections being made in certain areas for labor efficiency and labor shortage. Index includes construction overhead, sales taxes, compensation insurance and social security. The indexes have been primarily engineered to use as local cost conversion factors to construction cost data released by the Boeckh organization. Complete index formula is available in published form in " Boeckh's Index Calculator Tables."

Where Boeckh index is shown in these pages on charts with other building cost indexes, the average for all five Boeckh commercial and factory building indexes is used, converted to 1913=100.



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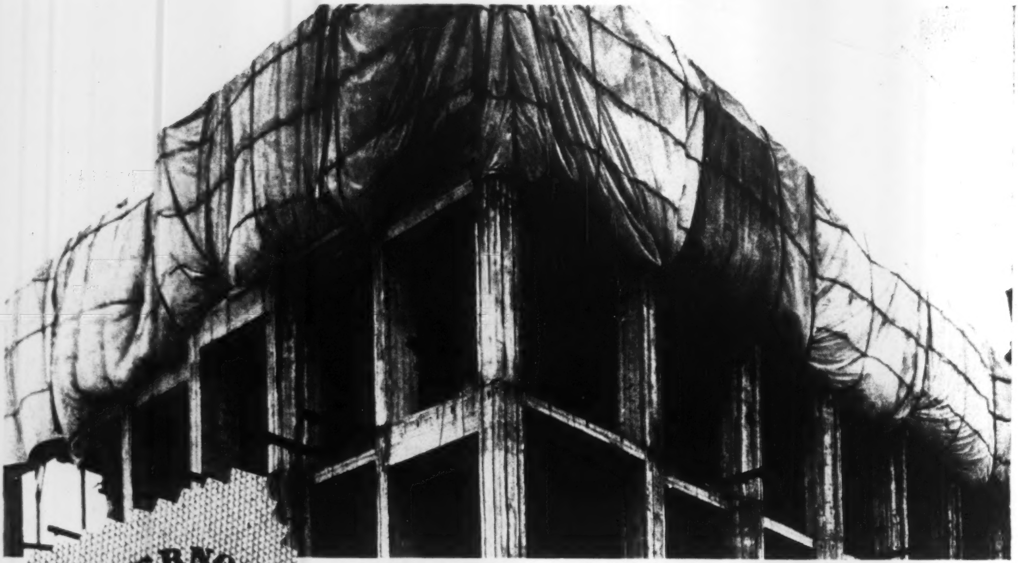

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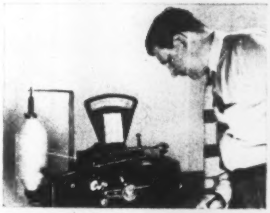
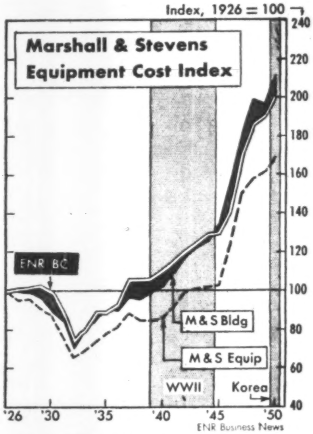


**CHECKING COEFFICIENT OF VARIATION** And Average Factor Of Quality On Evenness In Roving With Belger Tester. One of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products.



HOW EQUIPMENT cost increases compare with the rise in building costs since 1926 as shown by Marshall & Stevens indexes. The M&S Building cost index is also compared with the Engineering News-Record Building cost index for pre-war, war and post-war trends.

## American Appraisal Co. Building Cost Index

30-cities average and 22 individual cities, 1913 = 100

| | '26 | '32 | '39 | '42 | '45 | '48 | '49 | '50 | Dec⁴ '50 |
|---|---|---|---|---|---|---|---|---|---|
| **U. S. Av., 30 cities** | **217** | **155** | **200** | **241** | **271** | **490** | **490** | **500** | **517** |
| Boston | 224 | 169 | 210 | 248 | 270 | 477 | 485 | 506 | 521 |
| New York | 234 | 170 | 219 | 248 | 272 | 508 | 503 | 513 | 536 |
| Buffalo | 219 | 157 | 205 | 247 | 279 | 503 | 506 | 513 | 526 |
| Baltimore | 224 | 166 | 198 | 248 | 277 | 507 | 510 | 517 | 533 |
| Philadelphia | 225 | 161 | 196 | 247 | 275 | 477 | 481 | 498 | 513 |
| Pittsburgh | 236 | 172 | 219 | 249 | 279 | 486 | 486 | 496 | 516 |
| Cincinnati | 217 | 157 | 209 | 242 | 272 | 483 | 477 | 480 | 496 |
| Cleveland | 233 | 160 | 206 | 245 | 268 | 494 | 485 | 504 | 522 |
| Chicago | 219 | 162 | 205 | 235 | 260 | 456 | 452 | 467 | 488 |
| Indianapolis | 219 | 157 | 206 | 247 | 276 | 501 | 501 | 506 | 521 |
| Detroit | 224 | 148 | 208 | 252 | 278 | 504 | 500 | 516 | 539 |
| Milwaukee | 218 | 144 | 209 | 254 | 280 | 499 | 493 | 513 | 531 |
| Minneapolis | 197 | 148 | 202 | 235 | 266 | 455 | 453 | 462 | 475 |
| Kansas City | 220 | 156 | 209 | 239 | 268 | 480 | 469 | 478 | 495 |
| St. Louis | 230 | 163 | 208 | 238 | 265 | 478 | 478 | 487 | 504 |
| Atlanta | 211 | 147 | 186 | 240 | 278 | 521 | 514 | 522 | 543 |
| Dallas | 204 | 146 | 171 | 209 | 246 | 451 | 455 | 461 | 475 |
| New Orleans | 217 | 145 | 194 | 234 | 277 | 493 | 501 | 509 | 525 |
| Denver | 204 | 149 | 195 | 226 | 245 | 443 | 441 | 453 | 471 |
| Seattle | 199 | 141 | 196 | 244 | 277 | 506 | 509 | 518 | 533 |
| San Francisco | 188 | 144 | 183 | 225 | 244 | 446 | 446 | 461 | 477 |
| Los Angeles | 195 | 141 | 167 | 213 | 249 | 473 | 475 | 488 | 502 |

• **American Appraisal Company,** Milwaukee, Wis.—This index is based on detailed analysis of materials and labor required for four types of buildings (frame, brick, concrete and steel) in 30 representative cities. It is repriced monthly in accordance with: 1. prevailing wage scales and labor performance for the various building trades, and 2. quotations for construction materials in 30 key cities in the United States. The index corrects for labor productivity but assumes normal average conditions and does not give any recognition to overtime or bonus payments to labor or premiums paid for materials in individual cases or under temporary abnormal conditions. It applies to construction only, does not include plumbing, heating, lighting, sprinklers, fixtures and decorations.

## Equipment cost indexes—1926 = 100

| Industry | 1929 | 1932 | 1939 | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 12/50 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Average of All** | **91.9** | **86.1** | **84.8** | **103.4** | **123.2** | **150.6** | **162.8** | **161 2** | **167.9** | **177.1** |
| Commercial (aver. of 12*) | 91.8 | 67.6 | 86.8 | 105.2 | 120.9 | 146.9 | 158.6 | 152.7 | 159.8 | 168.3 |
| Transportation—garage | 91.5 | 69.2 | 83.6 | 100 9 | 123.9 | 157.0 | 171.1 | 170.3 | 179.7 | 190.3 |
| Public utility (aver. of 2*) | 91.8 | 70.1 | 82.9 | 97.5 | 119.5 | 145.8 | 159.6 | 159.7 | 164.8 | 172.9 |
| Process (aver. of 9*) | 90.5 | 73.2 | 83.6 | 103.8 | 123.0 | 149.1 | 161.9 | 161.1 | 166.6 | 174.8 |
| Food (aver. of 10*) | 92.6 | 68.5 | 84.9 | 104.1 | 126.1 | 156.8 | 169.7 | 169.2 | 177 1 | 185.9 |
| Metal working | 92.3 | 67.9 | 83.6 | 110.7 | 131.2 | 151.3 | 161.8 | 161.8 | 166.9 | 174.8 |
| Aircraft | 93.0 | 66.7 | 85.0 | 109.8 | 127.0 | 162.9 | 178.3 | 177.5 | 186.1 | 196.7 |
| Mach. and parts, elec. equip. | 92.0 | 68.0 | 83.4 | 106.8 | 130.3 | 156.6 | 167.4 | 167.7 | 175 0 | 185.4 |
| Textile | 91.1 | 67.8 | 83.7 | 101.8 | 122.1 | 146.6 | 157.4 | 157.3 | 165.9 | 180.5 |
| Woodworking | 92.0 | 67.2 | 83.6 | 100.9 | 123.0 | 149.6 | 160.4 | 160.4 | 165.5 | 173.4 |
| General (aver. of 7*) | 95.5 | 68.8 | 84.6 | 103.2 | 122.0 | 149.7 | 162.0 | 161.8 | 168.2 | 176.9 |
| Cold Storage—refrigerating | 92.0 | 70.0 | 82.1 | 101.7 | 125.7 | 163.2 | 176.6 | 175.8 | 185.2 | 195.8 |
| Contractors' equipment | 91 0 | 71.9 | 82.4 | 102.5 | 124.2 | 150.3 | 161.1 | 161.1 | 166.2 | 174.1 |

• **Marshall and Stevens,** Chicago, Ill.—Indexes cover both comparative building costs, 1902 to date, and comparative equipment costs, 1913 to date. The building indexes are national averages with a system of modifiers to get regional and municipal values for each of four types of building. A. Fireproof, protected steel, B. Fireproof, reinforced concrete, C. Masonry buildings, D. Frame. They are designed to reflect normal costs in line with recognized or published prices of building materials, equipment and labor. Extraordinary or intangible conditions are not included. Composite building cost series is converted to 1913 = 100 where compared with other indexes.

Comparative equipment costs, developed to cover the composite of the entire plant, machinery of various kinds, mechanical installation, furniture and fixtures, hand tools and other and combined in proper proportion to their average occurrence in each plant are computed for 47 industries. Eleven series are reproduced here, five of which are averages of 3 or more M&S related series. These are M&S estimates of actual costs paid for installed plant equipment, as a whole.

*** In each of these, MARSHALL AND STEVENS reports separate comparative equipment cost trends for:**

COMMERCIAL: Apartment, Bank, Church, Hotel, Library, Restaurant, School, Store, Theatre, Hospital, Dwelling, Office

PUBLIC UTILITY: Steam Power, Electric Power

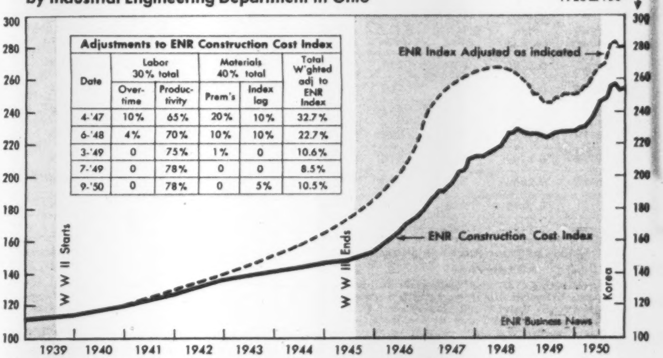
PROCESS: Distillery, Cement, Chemical, Glass, Petroleum Industry, Paint, Paper, Rubber, Clay Products

FOOD: Bakery, Bottling, Brewery, Candy, Cannery-fish, Cannery-fruit, Creamery, Dairy, (Flour, cereal feed), Packing-fruit, Packing-meat

GENERAL: Laundry, Mining and Milling, Motion Picture, Printing, Shipbuilding, Warehouses, Logging

## ENR Construction Cost Index adjusted for intangible costs

### by Industrial Engineering Department in Ohio



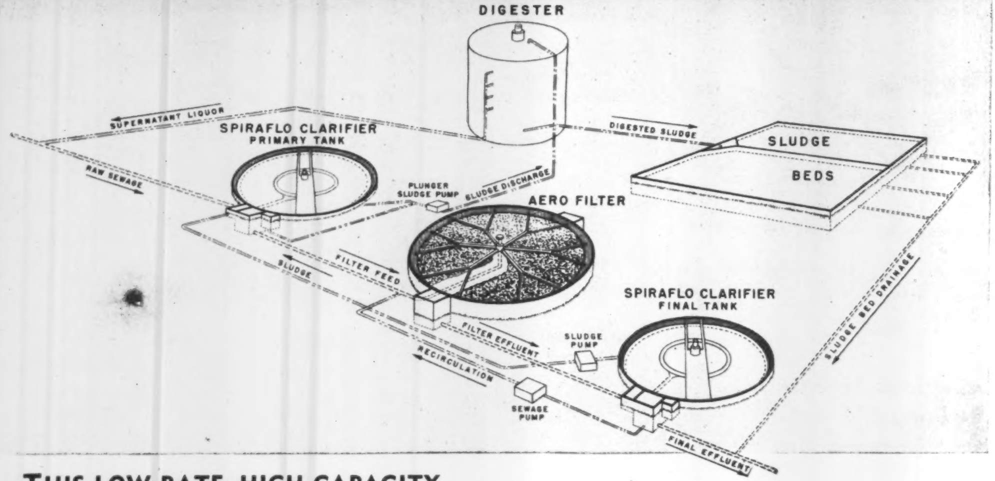
Adjustments to ENR Construction Cost Index

| Date | Labor 30% total | | Materials 40% total | | Total W'ghted adj to ENR Index |
|---|---|---|---|---|---|
| | Over-time | Productivity | Prem's | Index lag | |
| 4-'47 | 10% | 65% | 20% | 10% | 32.7% |
| 6-'48 | 4% | 70% | 10% | 10% | 22.7% |
| 3-'49 | 0 | 75% | 1% | 0 | 10.6% |
| 7-'49 | 0 | 78% | 0 | 0 | 8.5% |
| 9-'50 | 0 | 78% | 0 | 5% | 10.5% |

An industrial company in Ohio adds its own adjustments to the ENR Construction Cost Index to obtain an index used by its engineering department for various cost estimating purposes. These adjustments, shown in the table and chart, allow for labor overtime and productivity and for premium prices paid for materials during periods of shortages.

Improved balance in materials and labor supplies in 1949 produced a much sharper drop in the adjusted index than was shown in the ENR Construction Cost Index. The latter reflects only the trends in wage rates and materials prices, unadjusted for the "intangible costs" due to low productivity, substitute materials, delayed deliveries and consequent job slowdowns, overtime, or black or grey market buying.

# There's a YEOMANS Plant FOR EVERY WASTE TREATMENT NEED!



## THIS LOW RATE, HIGH CAPACITY TRICKLING FILTER PLANT IS ESTABLISHING AMAZING RECORDS FOR HIGH PURIFICATION AT EXCEPTIONALLY LOW COST

These figures show a taypical result produced by a Yeomans installation of the "Aero-Filter" and "Spiraflo" Clarifier in combination.

Overall plant efficiency is always higher when these units are used together. The method is especially effective for treating strong industrial wastes.

OPERATIONAL DATA . . . . SPIRAFLO—AERO-FILTER PLANT*

| | | Raw Sewage | | Primary Effluent | | | | Final Effluent | | | | Overall Plant Reduction | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1949 Date | Sewage Flow M.G.D. | Sus. SOLIDS PPM | B.O.D. PPM | Sus. SOLIDS PPM | Per Cent Reduction | B.O.D. PPM | Per Cent Reduction | Sus. SOLIDS PPM | % Reduction | % PPM | % Reduction | Sus. Solids % | B.O.D. % |
| 6-15 | 0.2996 | 210 | 255 | 79 | 62.4 | 136 | 46.6 | 28 | 64.6 | 18 | 86.8 | 86.6 | 93.0 |
| 6-16 | 0.2467 | 425 | 260 | 85 | 80.0 | 127 | 51.2 | 23 | 73.0 | 19 | 85.1 | 94.6 | 92.6 |
| 6-17 | 0.2554 | 410 | 235 | 124 | 69.7 | 141 | 40.0 | 28 | 77.4 | 18 | 87.3 | 93.3 | 92.4 |
| 6-18 | 0.2487 | 308 | 222 | 76 | 75.4 | 108 | 51.4 | 34 | 55.3 | 16 | 85.2 | 89.0 | 92.8 |
| 6-19 | 0.1753 | 222 | 218 | 64 | 71.2 | 132 | 39.5 | 17 | 73.5 | — | —— | 92.4 | —— |
| 6-20 | 0.2666 | 262 | 320 | 88 | 66.4 | 147 | 54.1 | 20 | 77.3 | 30 | 79.6 | 92.4 | 90.6 |
| 6-21 | 0.2279 | 240 | 215 | 78 | 67.5 | 138 | 35.8 | 19 | 75.7 | 20 | 85.7 | 92.0 | 90.7 |
| Average | 0.2456 | 297 | 247 | 85 | 70.5 | 132 | 45.5 | 24 | 71.0 | 20 | 85.0 | 91.5 | 92.0 |

* Name of plant furnished on request, as well as operating data from other installations.

### "SPIRAFLO" ADVANTAGES

- Increased B.O.D. and settleable solids removal—influent is introduced tangentially into annular race around the periphery. Sewage spirals downward slowly and enters main clarification compartment at the bottom of the tank. Uniform, slow diffusion of waste under the skirt results in greatly reduced velocities and provides maximum removal of settleable solids.
- Greater removal of finely divided particles—due to upward flow through sludge blanket. This increases flocculation and results in more effective removal of finely divided particles before waste enters the effluent weirs.
- Straight-wall design minimizes construction costs.

### "AERO-FILTER" ADVANTAGES

- Thorough uniform distribution—therefore costly recirculation for dilution is unnecessary
- Operating cost is lowest of any type of complete sewage treatment
- Uninterrupted and almost complete momentary bed coverage minimizes troubles from odors, freezing, ponding, filter flies
- All returns made direct to the filter—no oversize primary tank required.

FOR INDUSTRIAL WASTES, TOO . . . Many types of industrial wastes can be successfully treated by direct application to the Aero-Filter without preliminary sedimentation.

***Bulletins containing full details and helpful engineering data will be sent promptly upon request.***

**YEOMANS BROTHERS COMPANY**
**1445 North Dayton Street, Chicago 22, Illinois**
☐ "Aero-Filter"— No. 6570
☐ "Spiraflo" Clarifier—No. 6790
Please send these bulletins.
Name ..........................................
Business ..........................................
Address ..........................................
City .............................. State ..............

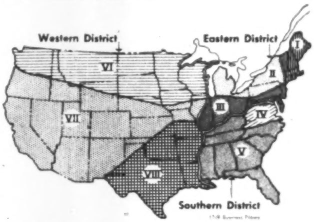
**YEOMANS**

YEOMANS PUMPS · GIVE YEOMAN SERVICE

A COMPLETE LINE OF SEWAGE AND WASTE TREATMENT EQUIPMENT AND PUMPS FOR BUILDINGS, MUNICIPALITIES, INDUSTRIAL APPLICATIONS

## Railroad cost index

Railroad Construction Cost Indexes released August 1, 1950, by Engineering Section, Bureau of Valuation, Interstate Commerce Commission, include items developed from analysis of major construction contracts over a period of years. Indexes for material accounts are based on studies of carriers' returns to Valuation Order 14, joint studies made with various sub-committees of President's Conference Committee, well-known engineering and trade publications, contracts covering major construction projects and other information furnished by individual carriers.



## Ratio of RR costs, 1949

| | % |
|---|---|
| **Road construction** | **73.09** |
| **Equipment, work** | **0.56** |
| Equipment, rolling & floating | 19.38 |
| General | 6.97 |
| **Total** | **100.00** |

## Road construction cost

ICC—(1910-14=100)

| By Districts & Regions | | Per Cent | 1926 | 1932 | 1939 | 1945 | 1948 | 1949 |
|---|---|---|---|---|---|---|---|---|
| I to VIII | | 73.09 | 166 | 131 | 137 | 197 | 271 | 270 |
| I | Eastern | 75.36 | 173 | 134 | 140 | 206 | 288 | 287 |
| II | Eastern | 68.15 | 168 | 133 | 141 | 202 | 281 | 283 |
| III | Eastern | 67.99 | 168 | 132 | 144 | 205 | 285 | 286 |
| IV | Southern | 70.49 | 163 | 126 | 131 | 195 | 262 | 259 |
| V | Southern | 76.66 | 164 | 129 | 136 | 195 | 265 | 265 |
| VI | Western | 77.41 | 164 | 129 | 132 | 190 | 257 | 253 |
| VII | Western | 75.62 | 166 | 131 | 133 | 188 | 258 | 256 |
| VIII | Western | 78.15 | 167 | 133 | 140 | 198 | 270 | 270 |

Indexes represent territorial index factors and are not for determining unit reproduction costs for individual roads.

| By Accounts | 1926 | 1932 | 1939 | 1945 | 1948 | 1949 |
|---|---|---|---|---|---|---|
| Engineering | 166 | 131 | 137 | 197 | 271 | 270 |
| Other Rt. of Way Exp. | 159 | 121 | 135 | 201 | 261 | 258 |
| Grading | 153 | 106 | 90 | 144 | 159 | 139 |
| Tunnels and Subways | 178 | 119 | 140 | 236 | 337 | 339 |
| Brdg., Culv. & Trestles | 170 | 122 | 149 | 240 | 367 | 374 |
| Elevated Structures | 165 | 129 | 149 | 249 | 377 | 382 |
| Ties | 173 | 144 | 158 | 241 | 298 | 302 |
| Rails | 144 | 140 | 136 | 152 | 244 | 245 |
| Other Track Material | 177 | 163 | 167 | 176 | 266 | 278 |
| Ballast | 175 | 146 | 143 | 181 | 235 | 254 |
| Trk. Laying & Surf. | 188 | 164 | 165 | 273 | 366 | 366 |
| Fences, Snw. Sheds, Sgns. | 178 | 147 | 141 | 189 | 271 | 279 |
| Stat. & Off. Bldgs. | 184 | 141 | 166 | 244 | 364 | 368 |
| Roadway Buildings | 187 | 140 | 162 | 258 | 380 | 386 |
| Water Stations | 182 | 147 | 166 | 227 | 325 | 327 |
| Fuel Stations | 180 | 144 | 159 | 242 | 357 | 357 |
| Shops & Eng. Houses | 185 | 137 | 165 | 248 | 372 | 379 |
| Grain Elevators | 190 | 137 | 164 | 236 | 367 | 367 |
| Storage Warehouses | 189 | 137 | 166 | 253 | 369 | 377 |
| Wharves & Docks | 177 | 136 | 153 | 255 | 346 | 350 |
| Coal & Ore Wharves | 174 | 136 | 153 | 236 | 338 | 341 |
| Tel. & Tel. Lines | 157 | 121 | 129 | 173 | 251 | 250 |
| Signals & Intrlocks. | 169 | 130 | 143 | 176 | 219 | 226 |
| Power Plants | 186 | 138 | 167 | 246 | 375 | 386 |
| Power Trnsmissn. Sys. | 176 | 143 | 148 | 190 | 258 | 266 |
| Misc. Structures | 186 | 141 | 161 | 229 | 372 | 378 |
| Roadway Machines | 151 | 138 | 154 | 187 | 267 | 270 |
| Roadway Small Tools | 190 | 155 | 180 | 200 | 310 | 315 |
| Public Impr. Const. | 169 | 131 | 142 | 217 | 316 | 321 |
| Shop Machinery | 186 | 155 | 202 | 236 | 319 | 324 |
| Power Plant Machnry. | 186 | 155 | 180 | 191 | 240 | 242 |
| Work equipment | 180 | 165 | 200 | 254 | 338 | 348 |

# Public utility construction cost index

**Compiled and published by Whitman, Requardt and Associates, Baltimore, Md.**

Individual series for 81 cost elements in three classes of utility construction, for five geographic divisions of the United States, are reported. Weighting is based on wide experience in cost analysis of plants and construction. Material prices from Engineering News-Record, Iron Age and various manufacturers; labor rates from utilities, unions and builders associations.

### Cost trends of building construction—1911 to 1914 = 100

(Complete Index reports 13 Items entering into Building Construction Costs.)
A relates to Reinforced Concrete Bldg.; B relates to Brick Bldg.

| | Jan. '26 | July '26 | Jan. '32 | July '32 | Jan. '39 | July '39 | Jan. '42 | July '42 | Jan. '45 | July '45 | Jan. '46 | July '46 | Jan. '47 | July '47 | Jan. '48 | July '48 | Jan. '49 | July '49 | Jan. '50 | July '50 | Jan. '51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Atlantic Seaboard Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 213 | 213 | 171 | 159 | 205 | 207 | 250 | 253 | 259 | 260 | 271 | 304 | 336 | 353 | 382 | 422 | 436 | 433 | 437 | 448 | 473 |
| B | 228 | 229 | 189 | 173 | 211 | 214 | 246 | 250 | 262 | 265 | 276 | 308 | 329 | 351 | 372 | 404 | 429 | 421 | 424 | 436 | 460 |
| **North Central Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 203 | 201 | 169 | 154 | 200 | 200 | 237 | 242 | 249 | 253 | 256 | 291 | 326 | 339 | 371 | 409 | 421 | 418 | 423 | 437 | 463 |
| B | 212 | 211 | 181 | 164 | 203 | 203 | 229 | 234 | 248 | 250 | 259 | 284 | 310 | 324 | 352 | 375 | 389 | 390 | 394 | 408 | 433 |
| **South Central Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 192 | 191 | 149 | 144 | 188 | 187 | 232 | 236 | 242 | 243 | 249 | 279 | 318 | 334 | 364 | 399 | 411 | 412 | 417 | 422 | 445 |
| B | 203 | 204 | 160 | 154 | 191 | 191 | 223 | 227 | 235 | 238 | 244 | 272 | 299 | 322 | 341 | 370 | 382 | 382 | 387 | 398 | 408 |
| **Plateau Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 198 | 197 | 153 | 149 | 194 | 194 | 230 | 235 | 238 | 239 | 248 | 278 | 307 | 327 | 349 | 385 | 402 | 397 | 400 | 418 | 435 |
| B | 211 | 210 | 167 | 163 | 199 | 200 | 221 | 227 | 231 | 233 | 257 | 286 | 309 | 331 | 349 | 378 | 396 | 395 | 396 | 410 | 427 |
| **Pacific Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 191 | 190 | 157 | 148 | 192 | 192 | 238 | 241 | 248 | 248 | 251 | 294 | 328 | 343 | 374 | 411 | 416 | 415 | 420 | 432 | 458 |
| B | 198 | 197 | 164 | 156 | 193 | 193 | 226 | 231 | 241 | 242 | 245 | 279 | 303 | 329 | 354 | 378 | 386 | 385 | 389 | 400 | 419 |

### Cost trends of gas plant construction—1911 = 100

(Complete Index reports 17 items entering into Gas Plant Construction Costs.)
A relates to Total Constr. & Equip.; B relates to Mech. Equip. Exclusive of Gas Holders

| | Jan. '26 | July '26 | Jan. '32 | July '32 | Jan. '39 | July '39 | Jan. '42 | July '42 | Jan. '45 | July '45 | Jan. '46 | July '46 | Jan. '47 | July '47 | Jan. '48 | July '48 | Jan. '49 | July '49 | Jan. '50 | July '50 | Jan. '51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Atlantic Seaboard Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 230 | 230 | 202 | 188 | 241 | 249 | 272 | 275 | 283 | 288 | 302 | 334 | 366 | 398 | 413 | 446 | 469 | 464 | 467 | 476 | 514 |
| B | 212 | 212 | 209 | 195 | 274 | 278 | 297 | 299 | 296 | 301 | 301 | 369 | 387 | 395 | 403 | 424 | 447 | 481 | 479 | 485 | 549 |
| **North Central Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 217 | 218 | 198 | 178 | 232 | 232 | 249 | 254 | 264 | 269 | 272 | 308 | 335 | 367 | 384 | 417 | 435 | 434 | 437 | 447 | 481 |
| B | 212 | 212 | 209 | 195 | 274 | 278 | 297 | 299 | 296 | 301 | 301 | 369 | 387 | 395 | 403 | 424 | 447 | 481 | 479 | 485 | 549 |
| **South Central Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 199 | 200 | 171 | 160 | 216 | 217 | 244 | 249 | 258 | 261 | 266 | 298 | 335 | 359 | 379 | 404 | 420 | 419 | 425 | 429 | 465 |
| B | 212 | 212 | 209 | 195 | 274 | 278 | 297 | 299 | 296 | 301 | 301 | 369 | 387 | 395 | 403 | 424 | 447 | 487 | 479 | 485 | 549 |
| **Plateau Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 202 | 202 | 176 | 166 | 216 | 217 | 232 | 237 | 240 | 243 | 255 | 290 | 313 | 344 | 359 | 386 | 403 | 398 | 401 | 405 | 440 |
| B | 212 | 212 | 209 | 195 | 274 | 278 | 297 | 299 | 296 | 301 | 301 | 369 | 387 | 395 | 403 | 424 | 447 | 481 | 479 | 485 | 549 |
| **Pacific Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 205 | 206 | 187 | 177 | 227 | 228 | 253 | 257 | 264 | 266 | 271 | 315 | 342 | 369 | 387 | 416 | 433 | 428 | 433 | 437 | 475 |
| B | 212 | 212 | 209 | 195 | 274 | 278 | 297 | 299 | 296 | 301 | 301 | 369 | 387 | 395 | 403 | 424 | 447 | 481 | 479 | 485 | 549 |

### Cost trends of electric light and power construction—1911 = 100

(Complete Index reports 51 items entering into Electric Light and Power Construction Costs.)
A relates to Total Constr. & Equip.; B to Accessory Electric Equipment† C to Sub-sta. Equip.

| | Jan. '26 | July '26 | Jan. '32 | July '32 | Jan. '39 | July '39 | Jan. '42 | July '42 | Jan. '45 | July '45 | Jan. '46 | July '46 | Jan. '47 | July '47 | Jan. '48 | July '48 | Jan. '49 | July '49 | Jan. '50 | July '50 | Jan. '51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Atlantic Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 197 | 194 | 182 | 176 | 224 | 225 | 248 | 248 | 251 | 259 | 266 | 303 | 327 | 351 | 357 | 377 | 401 | 400 | 399 | 409 | ... |
| B | 197 | 196 | 192 | 186 | 225 | 224 | 241 | 239 | 226 | 237 | 248 | 278 | 308 | 323 | 323 | 333 | 340 | 341 | 341 | 360 | 409 |
| C | 184 | 178 | 172 | 168 | 203 | 203 | 217 | 216 | 207 | 218 | 228 | 252 | 273 | 288 | 288 | 296 | 306 | 312 | 312 | 320 | 351 |
| **North Central Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 190 | 187 | 186 | 174 | 219 | 218 | 235 | 238 | 238 | 243 | 245 | 280 | 299 | 324 | 333 | 351 | 375 | 374 | 374 | 382 | ... |
| B | 189 | 188 | 199 | 186 | 224 | 223 | 229 | 231 | 216 | 218 | 222 | 249 | 272 | 289 | 292 | 300 | 309 | 307 | 310 | 324 | 376 |
| C | 178 | 171 | 181 | 169 | 203 | 202 | 207 | 209 | 198 | 200 | 204 | 225 | 240 | 257 | 260 | 264 | 278 | 280 | 283 | 286 | 320 |
| **South Central Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 184 | 183 | 179 | 171 | 218 | 218 | 245 | 246 | 248 | 251 | 251 | 288 | 310 | 336 | 344 | 365 | 391 | 390 | 390 | 399 | ... |
| B | 187 | 189 | 200 | 190 | 231 | 230 | 250 | 248 | 235 | 235 | 235 | 267 | 290 | 311 | 314 | 326 | 341 | 340 | 340 | 357 | 407 |
| C | 175 | 171 | 181 | 173 | 210 | 209 | 226 | 226 | 217 | 217 | 217 | 243 | 257 | 278 | 281 | 290 | 310 | 311 | 311 | 319 | 346 |
| **Plateau Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 190 | 188 | 177 | 171 | 218 | 219 | 234 | 236 | 238 | 241 | 244 | 282 | 300 | 329 | 334 | 355 | 378 | 378 | 376 | 386 | ... |
| B | 197 | 196 | 194 | 188 | 231 | 232 | 237 | 236 | 225 | 225 | 225 | 259 | 279 | 302 | 303 | 315 | 322 | 323 | 323 | 341 | 390 |
| C | 185 | 177 | 175 | 171 | 209 | 211 | 213 | 212 | 207 | 207 | 207 | 234 | 246 | 269 | 269 | 278 | 289 | 294 | 294 | 302 | 332 |
| **Pacific Division** | | | | | | | | | | | | | | | | | | | | | |
| A | 180 | 178 | 172 | 163 | 216 | 215 | 235 | 242 | 242 | 244 | 244 | 283 | 300 | 332 | 339 | 359 | 383 | 380 | 379 | 389 | ... |
| B | 178 | 177 | 182 | 170 | 222 | 222 | 231 | 240 | 225 | 225 | 225 | 256 | 275 | 303 | 303 | 317 | 328 | 323 | 323 | 343 | 394 |
| C | 167 | 161 | 164 | 155 | 203 | 202 | 210 | 219 | 208 | 208 | 208 | 234 | 244 | 272 | 273 | 284 | 298 | 297 | 297 | 307 | 340 |

† Formerly called "Electric Plant-Steam."

Here's your BLAW-KNOX
"Complete Package"
of concrete construction equipment

To give you all these advantages:

*One source* for every piece of equipment you need —from forms to finisher.

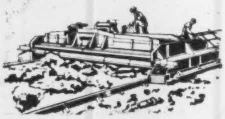
*One* undivided responsibility to back up the performance of all your equipment.

*One financial arrangement* covers the entire "package."

*One source* for parts and expert mechanical service.

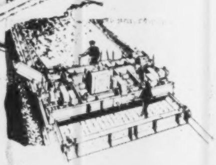
IN ADDITION to these one-source advantages, you get the lower cost operation that comes with 100% mechanized production. There are many other reasons why you get more and save more with the all-way benefits of the two Blaw-Knox "Complete Packages" of matched equipment—one for concrete paving and one for ready-mix concrete. See your Blaw-Knox distributor for complete details.

CLAMSHELL BUCKETS

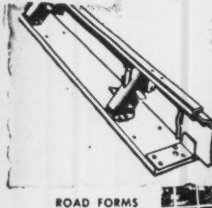


PAVING SPREADERS

FINISHING MACHINES

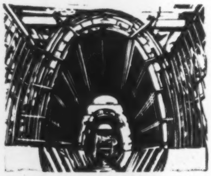


SUBGRADERS



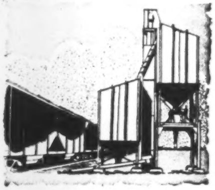
ROAD FORMS

CONCRETE BUCKETS

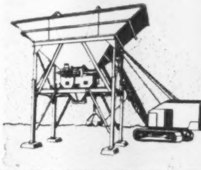


STEEL FORMS FOR GENERAL CONSTRUCTION

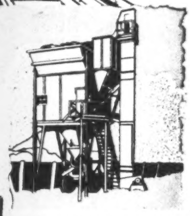
TRUCK MIXERS AND AGITATORS



BULK CEMENT PLANTS



AGGREGATE BATCHING PLANTS



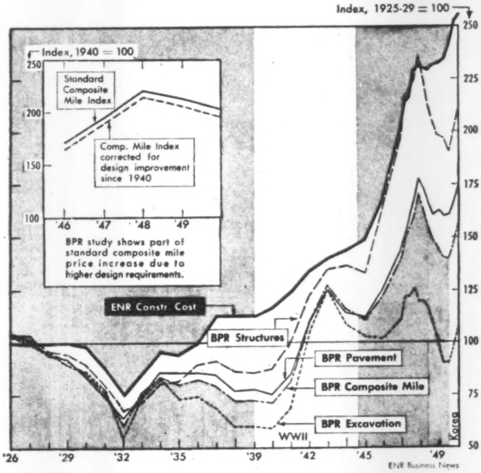
TRUCK MIXER LOADING PLANTS AND CENTRAL MIXING PLANTS

CURB AND GUTTER FORMS

BLAW-KNOX

BLAW-KNOX DIVISION OF BLAW-KNOX CO., Farmers Bank Bldg., Pittsburgh 22, Pa.
New York • Chicago • Philadelphia • Birmingham • Washington • San Francisco

# Price trends on highway construction for composite mile



## Highway price index—composite standard mile

U. S. Bureau of Public Roads, 1925-29 = 100

| Year | Excavation[1] 17,491 cy* Bid price[3] | Excavation[1] 17,491 cy* Sub-index | Surfacing[2] 3,728 sy* Bid price[3] | Surfacing[2] 3,728 sy* Sub-index | Structures: Reinf. steel 18,000* lb. Bid price[3] | Structures: Struct. steel 4,325* lb. Bid price[3] | Structures: Struct. concr. 88* cy Bid price[3] | Comb. Sub-index | Composite mile index |
|---|---|---|---|---|---|---|---|---|---|
| Base '25–29.. | $0.35† | 100.0 | $2.22† | 100.0 | $0.052† | $0.067† | $22.15† | 100.0 | 100.0 |
| 1926..... | .36 | 103.7 | 2.29 | 103.1 | .053 | .074 | 22.76 | 103.7 | 103.4 |
| 1932..... | .18 | 55.0 | 1.44 | 64.8 | .034 | .046 | 15.33 | 68.0 | 61.0 |
| 1939..... | .21 | 59.8 | 1.73 | 77.8 | .044 | .059 | 19.13 | 85.9 | 73.6 |
| 1942..... | .37 | 105.5 | 2.44 | 109.7 | .065 | .090 | 26.16 | 122.3 | 109.9 |
| 1945..... | .36 | 102.6 | 2.48 | 111.8 | .062 | .077 | 31.62 | 132.5 | 111.7 |
| 1946..... | .36 | 101.9 | 2.78 | 125.3 | .075 | .113 | 38.79 | 164.7 | 122.9 |
| 1947..... | .39 | 111.2 | 3.20 | 144.2 | .093 | .132 | 45.84 | 196.9 | 140.4 |
| 1948..... | .43 | 122.5 | 3.63 | 163.8 | .108 | .158 | 51.00 | 223.9 | 158.2 |
| 1Q..... | .42 | 119.7 | 3.83 | 172.7 | .113 | .167 | 49.04 | 223.6 | 161.5 |
| 2Q..... | .41 | 116.8 | 3.68 | 165.9 | .105 | .147 | 48.30 | 213.5 | 155.7 |
| 1949..... | .39 | 111.1 | 3.67 | 165.4 | .104 | .146 | 47.38 | 210.3 | 152.4 |
| 3Q..... | .38 | 108.6 | 3.56 | 160.5 | .100 | .136 | 47.21 | 205.8 | 148.7 |
| 4Q..... | .35 | 99.7 | 3.60 | 162.3 | .098 | .134 | 44.88 | 198.2 | 145.3 |
| 1Q..... | .32 | 91.2 | 3.54 | 159.6 | .096 | .133 | 44.96 | 197.0 | 140.7 |
| 2Q..... | .32 | 91.2 | 3.55 | 160.1 | .096 | .133 | 42.61 | 191.0 | 140.0 |
| 1950..... | .34 | 96.8 | 3.66 | 164.9 | .100 | .139 | 44.62 | 199.4 | 145.7 |
| 3Q..... | .34 | 96.9 | 3.68 | 165.9 | .100 | .137 | 44.66 | 199.4 | 146.2 |
| 4Q..... | .38 | 107.7 | 3.86 | 174.0 | .106 | .154 | 46.25 | 210.0 | 155.7 |

[1] Common excav. plus other excav. items expressed as equivalent common excav.
[2] Portland-cmt. concr. plus other surfacing expressed as equivalent portland-cmt. concr.
[3] Calculated to one more decimal place than shown in this table. * Fixed quantities used for establishing composite mile for price trend. † Prices used for establishing composite mile index base.

Common excavation for highways sold for 38 cents per cu yd during the 4th quarter of 1950, concrete pavement sold for $3.86 per sq yd, reinforcing steel for 10.6 cents per lb, structural steel for 15.4 cents per lb and structural concrete sold for $46.25 per cu yd. These are average prices bid by contractors as computed by the U. S. Bureau of Public Roads for its composite mile price index for highways.

The index itself is 155.7 for the 4th quarter of 1950, up 11% from the low of 140 reached in the 2nd quarter after coming down 15% below its all time high in the last quarter of 1948. The structures index is up 10% from its 2nd quarter value that was 19% below the last quarter high in 1948. Concrete pavement bid prices are up 9% since the first quarter of 1950 when they were 10% below their 1948 high. The wide price swings are in excavation which is 18% higher than its 1st half price in 1950. But this 1950 low was 27% below the 3rd quarter high in 1948.

## Highway price index based on California bids

An increase of 21.8% in the last 9 months of 1950 in prices bid on California highway construction pushes the index up to 194.8, still 10% below the 1948 record high. The most serious threat to reasonable future prices is the growing manpower shortage according to Richard H. Wilson, asst. state highway engineer, and H. C. McCarty, office engineer. Tables I and II show the California highway price index and its components.

### I—Highway price index and average contract prices

Division of Highways, State of California—1940=100

| Year | Roadway Excavation Per Cy | Crusher Run Base Per T | Plant Mix Surface Per T | Asphalt Concrete Pave. Per T | PCC Pavement Per Cy | PCC Structures Per Cy | Bar Reinf Steel Per Lb | Structural Steel Per Lb | Hwy. Constr. Price Index |
|---|---|---|---|---|---|---|---|---|---|
| 1940*.............. | $0.22 | $1.54 | $2.19 | $2.97 | $7.68 | $18.33 | $0.040 | $0.083 | 100.0 |
| 1941*.............. | 0.26 | 2.31 | 2.84 | 3.18 | 7.54 | 23.31 | 0.053 | 0.107 | 125.0 |
| 1942*.............. | 0.35 | 2.81 | 4.02 | 4.16 | 9.62 | 29.48 | 0.073 | 0.103 | 157.5 |
| 1943*.............. | 0.42 | 2.26 | 3.71 | 4.76 | 11.48 | 31.76 | 0.059 | 0.080 | 156.4 |
| 1944*.............. | 0.50 | 2.45 | 4.10 | 4.50 | 10.46 | 31.99 | 0.054 | 0.132 | 177.8 |
| 1945*.............. | 0.51 | 2.42 | 4.20 | 4.88 | 10.90 | 37.20 | 0.059 | 0.102 | 179.5 |
| '46, 1 Half**....... | 0.41 | 2.31 | 4.00 | 4.54 | 9.85 | 37.38 | 0.060 | 0.099 | 166.1 |
| '46, 2 Half**....... | 0.39 | 2.27 | 4.12 | 5.04 | 12.39 | 49.84 | 0.079 | 0.142 | 193.2 |
| '47, 1 Half**....... | 0.48 | 2.62 | 4.52 | 6.46 | 12.41 | 47.03 | 0.080 | 0.133 | 202.5 |
| '47, 2 Half*........ | 0.54 | 2.39 | 4.02 | 6.48 | 11.58 | 50.15 | 0.089 | 0.123 | 204.1 |
| '48, 1 Half*........ | 0.56 | 2.45 | 4.42 | 4.91 | 13.37 | 49.51 | 0.094 | 0.145 | 216.8 |
| '48, 2 Half*........ | 0.52 | 2.64 | 4.80 | 7.00 | 14.01 | 49.08 | 0.103 | 0.131 | 216.1 |
| '49 1 Q*........... | 0.49 | 2.48 | 4.54 | 5.70 | 11.84 | 48.11 | 0.089 | 0.113 | 200.4 |
| '49 2 Q*........... | 0.43 | 2.91 | 4.63 | 4.06 | 11.74 | 48.63 | 0.083 | 0.110 | 195.7 |
| '49 3 Q*........... | 0.41 | 2.40 | 5.05 | 4.60 | 11.53 | 45.35 | 0.080 | 0.093 | 187.9 |
| '49 4 Q*........... | 0.43 | 2.55 | 3.78 | 3.50 | 12.66 | 44.54 | 0.078 | 0.092 | 178.8 |
| '50 1 Q*........... | 0.34 | 2.22 | 3.65 | 3.74 | ..... | 40.15 | 0.077 | 0.081 | 180.0 |
| '50 2 Q*........... | 0.40 | 2.13 | 4.48 | 3.74 | 10.86 | 43.03 | 0.080 | 0.105 | 180.0 |
| '50 3 Q*........... | 0.41 | 2.32 | 4.25 | 5.50 | 10.91 | 44.34 | 0.093 | 0.131 | 189.2 |
| '50 4 Q*........... | 0.42 | 2.81 | 4.64 | 4.61 | 12.55 | 43.18 | 0.098 | 0.120 | 194.8 |

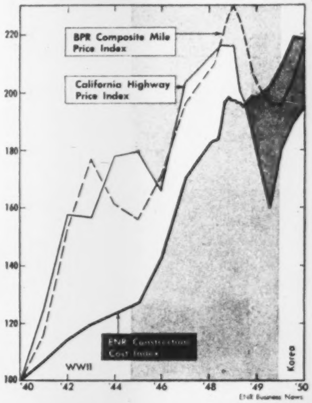
*All projects. **Federal-aid projects only.

### II—Quantities of contract items

| Contract items (,000 omitted) | 1948 | 1949 | 1950 |
|---|---|---|---|
| Roadway Excavation............cy | 15,697 | 15,352 | 17,599 |
| Crusher Run Base..............t | 682 | 309 | 429 |
| Plant-Mix Surfacing............t | 1,501 | 1,453 | 1,982 |
| Asphalt Concrete...............t | 34 | 15 | 120 |
| Port Cmt Concr Pave...........cy | 209 | 258 | 308 |
| Cl "A" Port Cmt Concr (Struct)..cy | 164 | 140 | 177 |
| Bar Reinforcing Steel...........lb | 27,305 | 23,712 | 28,881 |
| Structural Steel................lb | 36,414 | 17,692 | 17,772 |

### III—Average number of bidders

| By size of project in 1950 | First half | Second half |
|---|---|---|
| Up to $50,000........................ | 5.4 | 4.4 |
| $50,000 to $100,000.................. | 8.6 | 6.3 |
| $100,000 to $250,000................. | 8.6 | 7.4 |
| $250,000 to $500,000................. | 7.7 | 7.3 |
| $500,000 to $1,000,000............... | 10.0 | 11.1 |
| Over $1,000,000...................... | 10.0 | 7.8 |
| Aver. all projects................... | 7.0 | 5.8 |



CALIFORNIA'S highway construction price index is based on the average contract prices for the eight principal classes of construction shown in the accompanying table. The index is weighted each year according to the actual quantities of each of these contract items. The base is 1940 = 100, 1940 quantities multiplied by 1940 average contract prices. The price index for each period is computed by extending total quantities.

The larger sized jobs continued to draw the most bidders, as in previous years. Table III shows how this competition lined up, by size of project.

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CHICAGO (3) 1218 First National Bank Bldg.
DES MOINES (8) 915 Tuttle Street
DALLAS (1) 1219 Praetorian Bldg.
SEATTLE 922 Lane Street
SANTA CLARA, CAL. 621 Alviso Road

# Construction materials prices in 20 cities

## Market quotations on construction materials reported monthly by ENR correspondents

| | CEMENT, Bulk, per bbl CL lots: Incl Dealer Comn. fob city | | | SAND, per ton Truck lots or over fob city | | | CONCRETE, READY-MIXED 1:2:4, over 50 cy per cy, delivered | | | BRICK, CLAY BACKING 3 x 4 x 8½ in per M, CL lots fob city | | | STRUCTURAL CLAY TILE Partition, Scored, 3 x 12 x 12 per M 2000 pieces or over delivered | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1950 | | 1951 | 1950 | | 1951 | 1950 | | 1951 | 1950 | | 1951 | 1950 | | 1951 |
| | Low | High-Dec. | Mar. | Low | High-Dec. | Mar. | Low | High-Dec. | Mar. | Low | High-Dec. | Mar. | Low | High-Dec. | Mar. |
| **Average** | **2.96** | **3.09** | .... | **1.96** | **2.04** | .... | **10.31** | **10.70** | ..... | **27.86** | **29.85** | ..... | **132.87** | **136.46** | ...... |
| **Atlanta** | 3.10 | 3.35 | 3.35 | 1.75 | 1.75 | 1.75 | 11.00 | 11.00 | 11.00 | 25.00 | 26.75 | 26.75 | ...... | ...... | ...... |
| **Baltimore** | 3.14 | 3.24 | 3.34 | 1.95[c] | 1.95[c] | 2.00[e] | 10.25 | 10.50 | 10.80 | 32.00[c] | 36.00[c] | 37.00[c] | 175.00 | 175.00 | 175.00 |
| **Birmingham** | 2.68 | 2.68 | 2.68 | 1.84 | 1.84 | 1.94 | 7.75 | 7.75 | 7.85 | 20.00 | 20.00 | 23.50 | 97.50 | 97.50 | 118.00 |
| **Boston** | 3.41 | 3.51 | 3.61 | 2.50[d] | 2.50[d] | 2.50[d] | 10.45[h] | 10.45[h] | 11.50[h] | 32.00 | 33.50 | 33.50 | 140.00[r] | 149.00[r] | 149.00 |
| **Chicago** | 2.61 | 3.03 | 2.99 | 3.20[cd] | 3.40[cd] | 3.40[cd] | 9.70 | 11.00 | 11.50 | 21.00[cq] | 21.00[cq] | 21.00[cq] | 115.00 | 135.00 | 135.00 |
| **Cincinnati** | 3.08 | 3.18 | 3.18 | 1.85[c] | 2.05[c] | 2.05[c] | 10.15[i] | 11.65[ij] | 10.95[i] | 32.25 | 38.50 | 43.00 | 170.00[s] | 170.00[s] | 175.00[s] |
| **Cleveland** | 2.75 | 2.80 | 2.90 | 1.55 | 1.55 | 1.65 | 11.80[k] | 13.00[k] | 13.00[k] | 28.50[c] | 30.00[c] | 32.00[c] | 118.00[t] | 118.00[t] | 151.00[t] |
| **Dallas** | 2.49 | 2.54 | 2.65 | 1.75 | 1.75 | 1.84 | 9.30 | 9.30 | 9.30 | 18.75 | 18.75 | 18.75 | ...... | ...... | ...... |
| **Denver** | 3.29 | 3.49 | 3.64 | 1.15 | 1.15 | 1.15 | 9.65 | 9.75 | 10.00 | 32.00 | 34.00 | 34.00 | ...... | ...... | ...... |
| **Detroit** | 2.73 | 2.85 | 2.98 | 3.00[cd] | 3.50[cd] | 3.50[cd] | 9.65 | 10.10 | 10.50 | 31.50 | 33.50 | 33.50 | ...... | ...... | 118.65 |
| **Kansas City** | 2.85 | 2.98 | 3.03 | 1.30[c] | 1.50[c] | 1.50[c] | 10.40[l] | 10.40[l] | 10.95[l] | 22.63 | 26.00 | 26.00 | 115.00 | 115.50 | 115.00 |
| **Los Angeles** | 3.32 | 3.40 | 3.52 | 1.74[c] | 1.90[c] | 1.95[c] | 9.70[hm] | 10.15[hm] | 10.50[hm] | 20.00 | 20.00 | 20.00 | ...... | ...... | ...... |
| **Minneapolis** | 3.07[a] | 3.27[a] | 3.37[a] | 1.35[ce] | 1.45[cef] | 1.45[ce] | 10.50[e] | 11.55[e] | 11.75[e] | 30.00 | 32.00 | 32.00 | 158.00[s] | 165.00[s] | 171.50[s] |
| **New Orleans** | 2.65 | 2.80 | 2.80 | 1.82 | 1.82 | 1.82 | 12.40 | 12.90 | 12.90 | 29.00 | 29.00 | 29.00 | 160.00 | 160.00 | 160.00 |
| **New York** | 3.24 | 3.34 | 3.44 | 1.45[dg] | 1.45[dg] | 1.60[dg] | 10.50[n] | 11.15[n] | 11.40[n] | 33.00 | 35.00 | 38.50 | 118.20[w] | 121.60[w] | 121.60[w] |
| **Philadelphia** | 3.02 | 3.12 | 3.22 | 2.05[c] | 2.05[c] | 2.15[c] | 10.80 | 11.15 | 11.50 | 27.00 | 29.00 | 29.00 | 126.30 | 126.30 | 126.30 |
| **Pittsburgh** | 2.85 | 3.04 | 3.04 | 2.00[c] | 2.00[c] | 2.10[c] | 10.85 | 11.00 | 11.00 | 26.00 | 32.00 | 32.00 | 98.00 | 112.00 | 112.00 |
| **St. Louis** | 2.75[b] | 2.92[b] | 3.02[b] | 2.20[cb] | 2.37[cb] | 2.50[cb] | 9.40 | 10.40[o] | 10.40 | 32.50 | 37.00 | 40.00 | 120.00[t] | 120.00[t] | 136.00[t] |
| **San Francisco** | 2.99 | 2.99 | 2.95 | 1.94 | 1.96 | 1.96 | 10.15[p] | 10.75[p] | 10.75[p] | 32.00 | 33.00 | 35.00 | 132.00[uv] | 132.00[uv] | 156.85[uv] |
| **Seattle** | 3.05 | 3.25 | 3.25 | 2.75[hcd] | 3.00[hcd] | 3.00[hcd] | 9.75[h] | 10.95[h] | 10.95[h] | 32.00 | 32.00 | 39.00 | 150.00[t] | 150.00[t] | 160.00[t] |
| **Montreal** | 2.31 | 2.51 | 2.51 | 1.90 | 2.00[d] | 1.90 | 9.05 | 9.05 | 10.50 | 25.50 | 26.50 | 26.50 | 115.00[ux] | 143.00[ux] | 143.00[ux] |

[a] CL price, dealers sell only LCL. [b] 2% cash disc. [c] delivered. [d] per cy. [e] 5% cash disc. [f] Dec. $1.35. [g] barge lots asd. [h] 50c cash disc. [i] up to 500 cy. plus. [j] Dec. $10.95. [k] 7-9 mi zone. [l] 25 cy [m] 1:2½:4 mix [n] fob plant. [o] Dec. $10.15. [p] 10-100 cy. [q] 3½ x 4 x 8½. [r] fob yard. [s] truck lots. [t] truck delivery. [u] smooth. [v] fob Stockton. [w] fob trucks job site NYC. [x] Provincial and municipal tax extra.

| | LUMBER, No. 2 Common or better, 2 x 4 s4s | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Short Leaf Yellow Pine | | | | Douglas Fir | | | |
| | 1950 | | | 1951 | 1950 | | | 1951 |
| | Jan.-Low | High | Dec. | Mar. | Jan.-Low | High | Dec. | Mar. |
| **Average** | **74.65[e]** | **102.50** | **90.15** | ...... | **84.11** | **114.09** | **102.90** | ...... |
| **Atlanta** | 60.00[i] | 78.00[i] | 67.50[i] | 67.50[i] | ...... | ...... | ...... | ...... |
| **Baltimore** | 60.00[j] | 105.00[j] | 85.00[j] | 80.00[j] | 74.50[fj] | 119.00[j] | 86.50[j] | 112.00[j] |
| **Birmingham** | 63.00[i] | 65.00[i] | 65.00[i] | 70.00[i] | 65.00[i] | 77.50[i] | 75.00[i] | 75.00[i] |
| **Boston** | 85.00[ahj] | 100.00[hj] | 85.00[hj] | 92.00[hj] | 94.00[p] | 119.00[p] | 100.00[p] | 115.00[p] |
| **Chicago** | 73.00[k] | 106.00[k] | 91.00[k] | 95.00[k] | 83.50[k] | 124.00[k] | 100.00[k] | 115.00[k] |
| **Cincinnati** | 76.00[bj] | 125.00[j] | 98.75[j] | 93.50[j] | 83.00[j] | 122.60[j] | 108.00[j] | 125.50[j] |
| **Cleveland** | 66.75[k] | 110.00[k] | 87.50[k] | 95.00[k] | ...... | ...... | ...... | ...... |
| **Dallas** | 60.00[i] | 69.00[i] | 69.00[i] | 69.00[i] | ...... | ...... | ...... | ...... |
| **Denver** | ...... | ...... | .... | .... | 86.00[j] | 134.00[j] | 106.00[j] | 128.00[j] |
| **Detroit** | 65.00[cl] | 110.00[l] | 90.00[l] | 90.00[l] | 80.00[l] | 114.00[l] | 100.50[l] | 100.00[l] |
| **Kansas City** | 90.00[j] | 132.00[j] | 120.00[j] | 120.00[j] | 90.00[j] | 134.50[j] | 120.00[j] | 120.00[j] |
| **Los Angeles** | ...... | ...... | ...... | ...... | 71.00[n] | 115.00[n] | 88.00[n] | 108.00[n] |
| **Minneapolis** | ...... | ...... | ...... | ...... | 100.00[m] | 140.00[m] | 135.00[m] | 130.00[m] |
| **New Orleans** | 70.00[i] | 79.00[i] | 75.00[i] | 79.00[i] | 71.00[i] | 80.00[i] | 80.00[i] | 80.00[i] |
| **New York** | 85.00[o] | 125.00[o] | 105.00[o] | 110.00[o] | 95.00[o] | 130.00[o] | 115.00[o] | 122.50[o] |
| **Philadelphia** | 92.50 | 122.00 | 122.00 | 122.00 | 110.00 | 135.00 | 135.00 | 135.00 |
| **Pittsburgh** | 77.50[i] | 97.50[i] | 85.00[i] | 87.50[i] | 95.00[i] | 105.00[i] | 97.50[i] | 100.00[i] |
| **St. Louis** | 84.00[dm] | 121.00[m] | 106.50[m] | 116.25[m] | 99.88[m] | 147.50[m] | 128.25[m] | 138.00[m] |
| **San Francisco** | ...... | ...... | ...... | ...... | 67.00[gi] | 92.00[i] | 92.00[i] | 72.50[i] |
| **Seattle** | ...... | ...... | ...... | ...... | 62.50[i] | 90.00[i] | 82.50[i] | 82.50[i] |
| **Montreal** | 70.00[h] | 75.00[h] | 75.00[h] | 92.00[h] | 140.00 | 165.00 | 160.00 | 175.00 |

[a] Jan. $91. [b] Jan. $80. [c] Jan. $66. [d] Jan. $85.50. [e] Jan. $74.68. [f] Jan. $76. [g] Jan. $68. [h] spruce. [i] fob mill. [j] fob city CL out of yard. [k] fob city CL direct mill. [l] deliv to contr. [m] retail LCL deliv. [n] retail LCL at yard. [o] deliv, truck lots. [p] asd.

# Building materials prices

## Average yearly prices at New York, except steel and cast iron pipe

| Year | Brick common per M | Cement per bbl | Lime per bbl | Pine per M ft BM | Steel shapes per cwt | Cast iron pipe per ton |
|---|---|---|---|---|---|---|
| 1874 | $7.41 | $1.48R | $1.50a | $26.00d | .. | $43.76h |
| 1890 | 6.65 | 2.25R | .95a | 21.75d | ... | 24.65h |
| 1907 | 6.16 | 1.55 | .95a | 30.50d | 1.75 | 31.52i |
| 1913 | 6.75 | 1.18 | .915a | 25.04e | 1.50 | 21.96i |
| 1929 | 11.71 | 2.23 | 2.25b | 64.50f | 1.92 | 36.66i |
| 1932 | 9.75 | 1.62 | 2.25b | 39.91f | 1.56 | 30.58i |
| 1938 | 13.10 | 2.12 | 2.80b | 59.33f | 2.18 | 48.33i |
| 1939 | 13.46 | 2.20 | 2.80b | 64.35f | 2.10 | 46.75i |
| 1942 | 14.17 | 2.20 | 2.80b | 85.61f | 2.10 | 49.00i |
| 1947 | 26.38 | 3.46 | 24.34c | 115.83g | 2.61 | 75.46i |
| 1948 | 30.33 | Cl4.05p | 26.32c | 114.38g | 2.98 | 91.83i |
| 1949 | 33.00 | 4.23 3.32 | 26.80c | 98.13g | 3.25 | 91.17i |
| 1950 | 33.50 | .... 3.52 | 27.10c | 131.88g | 3.42 | j |

BRICK: wholesale, fob; CEMENT: net, delivered *R* Rosendale, rest Portland in cloth bags delivered — 1949-50 in paper bags, fob city in carload lots; LIME: *a* common lump, wholesale, fob, 180 lb., net, *b* 280 lb., *c* common hydrated, delivered, per ton (40 bags of 50 lb. ea) no longer quoted per bbl.; LUMBER: No. 1 common, rough, *d* 1-in. yellow pine, wholesale at dock, *e* 3-in. LLYP, *f* 3 x 12 LLYP from Lumber Trade Jl., *g* 3 x 12 SLYP (LLYP out of market): STEEL: fob Pittsburgh; CAST IRON PIPE: fob Delaware River foundries, *h* all classes bell and spigot, *i* 6-in. and larger, Cl B or heavier bell and spigot. ; *j* discontinued 1950:

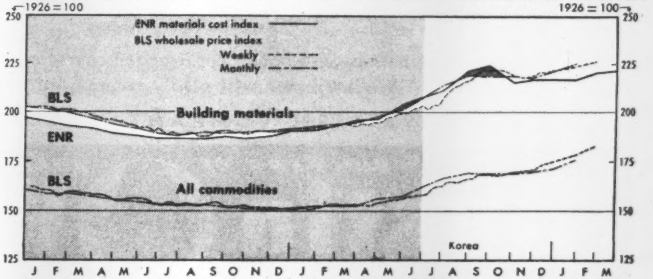
# Wholesale price index US Bu. of Labor Statistics

## Building materials—monthly index

| Components | 1929 | 1932 | 1939 | 1946 | 1948 | 1949 | 1950 |
|---|---|---|---|---|---|---|---|
| | 1926 = 100 | | | | | | |
| **All** | **95.4** | **71.4** | **90.5** | **132.2** | **198.6** | **193.3** | **206.1** |
| Brick and tile | 94.3 | 77.3 | 91.4 | 123.0 | 155.7 | 161.7 | 168.5 |
| Cement | 91.8 | 77.2 | 91.3 | 104.1 | 130.4 | 133.8 | 136.5 |
| Lumber | 93.8 | 58.5 | 93.2 | 177.5 | 311.2 | 286.0 | 327.5 |
| Paint | 94.9 | 71.1 | 82.8 | 118.3 | 159.6 | 151.3 | 142.0 |
| Plumb & heat | 95.0 | 66.8 | 79.2 | 103.5 | 147.6 | 154.8 | 162.6 |
| Struc. steel | 98.1 | 80.9 | 107.3 | 118.5 | 163.7 | 179.3 | 192.7 |
| Other | 97.7 | 79.5 | 90.3 | 117.9 | 167.6 | 171.7 | 178.5 |

BLS, late in 1948, launched a new weekly wholesale price index covering building materials predominant in housing cost. This has 23 components, the monthly index has 114.

## Building Materials prices rise with war and defense mobilization

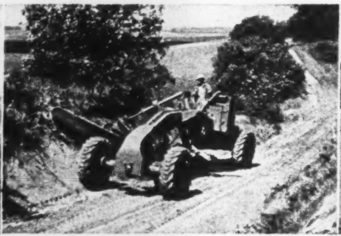


ENR Business News Dept.

# BUILT TO OUTPERFORM

## The Power Graders That Have Everything

"88-H"—a new model of medium size with all the extra traction and maneuverability of All-Wheel Drive and All-Wheel Steer.

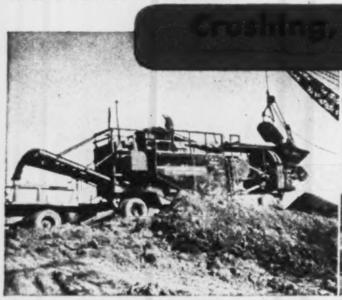


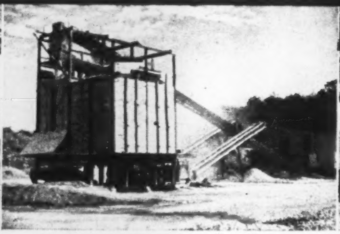
"99-H"—popular with contractors and highway departments for its all around performance, under all conditions, in all seasons.

MASTER "99"—combining the best features of the "99-H" with the extra power, traction and road speed of its 100 horsepower engine.

## Crushing, Screening and Washing Plants

PORTABLE . . . STATIONARY

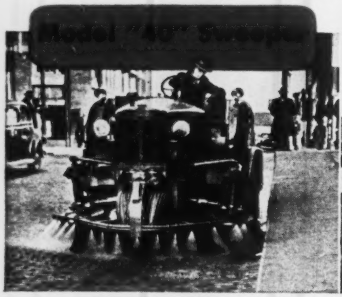




The AUSTIN-WESTERN LINE includes Jaw Crushers and Roll Crushers in a wide range of sizes; plus matching screens, elevators, conveyors and bins. Exclusive features increase output, and reduce maintenance costs.

Skilled engineering characterizes each and every Austin-Western crushing, screening and washing plant, which is tailor-made for a particular production problem. We would welcome the opportunity to discuss yours.

## Model "40" Sweeper



Fast, maneuverable and economical. Dirt is thrown directly into the 2-yard hopper. Right-hand or left-hand gutter broom, or both.

## Road Rollers

3-WHEELED . . . TANDEM

3-WHEELED ROLLERS with hydraulic scarifiers. TANDEM ROLLERS of the variable weight type. All with gas or diesel engines.

## Badger Convertible Shovel

The ¾-swing Badger wastes no power swinging extra weight; makes more swings per hour; can work in closer quarters.

Advanced engineering and honest construction characterizes each Austin-Western product. Your nearby A-W distributor will gladly recommend the one best suited to your needs.

**AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U. S. A.**

*BUILDERS OF ROAD MACHINERY*

**Austin Western**

*SINCE 1859*

# Materials outside USA

## NORTH AMERICA

● **Anchorage, Alaska:** Shortages exist, in the same items as in the U. S., but in others only when transportation is inadequate, as virtually all materials are brought to Alaska by boat.

● **Havana, Cuba:** Materials were available in June, 1950, but in December shortages in cement and reinforcing bars were reported.

● **San Juan, Puerto Rico:** Materials are subjected to the same controls as in the U. S. The worst shortages are in copper, tin, steel, lead and copper pipes. Building material shipments from the mainland have increased 25% in value since the outbreak of the Korean war.

## SOUTH AMERICA

● **Bogota, Colombia:** Materials are available with the exception of some imported raw materials. The supply of structural shapes seems to be sufficient for orders up to 1952 unless an emergency occurs holding them back.

● **Lima, Peru:** Construction materials are available as needed.

● **Rio de Janeiro, Brazil:** Materials are available, but at a price. Much of the iron, steel and cement needs are imported and these supplies suffered severely in 1950 from import restrictions, which now have eased up somewhat. Biggest shortage is in lumber where prices rose sharply because suppliers received better prices from exporters than from builders.

● **Santiago, Chile:** Materials generally are available where they are made locally. But shortages of first-class materials exist in some lines, such as hardware, which formerly was imported.

● **Buenos Aires, Argentina:** Sand, gravel, steel and cement are in short supply. Premiums were added to June prices to ensure supplies of sand and lumber at that time. Nothing is really plentiful.

## EUROPE

● **London, England:** Shortages exist in cement, steel, timber, brick, zinc and other non-ferrous metals, and certain types of reinforcing steel. Steel was available in June, 1950 only for construction that had government licenses. More critical than material shortage was a shortage of construction machinery in June.

● **Stockholm, Sweden:** Shortage of materials is showing up in longer delivery times. Sheet steel leads the scarcity list. Swedish pulp and lumber is bartered for the more costly imported steel.

● **Madrid, Spain:** Construction materials short in June still are in short supply in December, particularly cement, iron and steel. Insufficient quantity of materials purchased at official prices from government agencies has forced contractors to buy at much higher prices through an elaborate black market system.

● **Paris, France:** Materials are available as needed, except for steel where delivery has lagged one to three months due to rearmament buying. Steel shortages will continue as long as the present crisis does.

● **Amsterdam, Netherlands:** No troublesome shortages of materials felt in 1950. But since Korea prices of timber, iron, steel and non-ferrous metals have been rising sharply. An acute shortage of timber is expected and shipments of metal products for construction are decreasing.

● **Frankfort, Germany:** While there were no shortages of materials in June the situation has changed to one of continued shortages by December. Increased defense activity will make these worse. Current coal shortages keep down production of cement. Lumber is getting more scarce and expensive, substitutes in dwelling construction more common.

● **Milan, Italy:** Construction is threatened by a shortage of coal and iron. Scrap iron has increased in price from 50 to about 88 lire a kilogram since June.

## AFRICA, ASIA & AUSTRALIA

● **Cairo, Egypt:** Construction materials are available, if you pay the price. Cement, scarce in June, was plentiful in December.

● **Johannesburg, South Africa:** Materials generally available as needed except for shortages in steel, timber and cement.

● **Haifa, Israel:** Local sand and gravel supplies are sufficient but part of the cement supply and all steel and timber supplies must be imported. Due to shortage both of foreign exchange and of barterable exports, they are in short supply.

● **Bombay, India:** Materials are still difficult to obtain, particularly steel and cement, due more to transportation bottlenecks than actual shortages. Brick and wood are easily available but Burma teak, best quality of wood, is hard to obtain. Sand is available but of poor quality.

● **Tokyo, Japan:** Korean war brought rapid price increases for most construction materials due to U. S. military purchasing power. Materials are available, if you pay the price. Banning of Chinese trade has hit the steel industry by blocking sources of low-cost coking coal and iron ore imports.

● **Manila, Philippines:** Adequate supply of local materials but shortage of imports.

● **Melbourne, Australia:** Construction materials are available only through importation or long-term forward contracts. Shortages are chronic in structural steel, local cement, brick, tile, corrugated and galvanized sheet steel.

# Materials prices outside the United States

## Rates converted to U.S. dollars, in June and Dec., 1950, (fob city)

### NORTH AMERICA

| City and Country | Struct. steel /cwt. | | Reinf. steel /cwt. | | Portland cement/bbl. | | Lumber/M f bm 1st cl. pine | | 2nd cl. pine | | Loc. equiv. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dec. | June | Dec. | June | Dec. | June | Dec. | June | Dec. | June | Dec. | June |
| **Anchorage** | $4.05[b] | $4.05[b] | $5.35[b] | $5.35[b] | $3.25[b,l] | $3.05[b,l] | $100.00[q] | $90.00[q] | $100.00[q] | $90.00[q] | $100.00[q] | $90.00[q] |
| **Montreal** | 6.14[c,d] | 6.14[c,d] | 4.32[c,d] | 4.32[c,d] | 2.42[m,n] | 2.24[m,n] | 68.25[r,s] | 63.70[r,s] | 146.00[r,w] | 127.40[r,w] | ...... | ...... |
| **SanFrancisco** | 6.30[e] | 6.00[e] | 5.75[d,i] | 5.75[i,k] | 3.39[n,o] | 3.39[n,o] | 95.00[A,t,u] | 67.00[t] | ........ | ........ | ...... | ...... |
| **New York** | 5.75[f] | 5.65[f] | 5.69[i] | 5.58[i] | 3.61[n,o] | 3.49[n,o] | 80.00[v] | 115.00[B,w] | 105.00[s] | 135.00[C,s] | ...... | ...... |
| **Mexico City** | 5.42[h] | 5.35[b] | 6.41[j] | 5.66[j] | 2.72[p] | 2.50 | 120.92 | 98.27 | 109.83 | 86.70 | 92.49 | 69.36 |
| **Havana**[a] | 20.00 | 12.50 | 7.75 | 5.25 | 4.31 | 4.31 | ......... | ....... | 175.00 | 145.00 | ...... | ...... |
| **San Juan** | 12.00 | 7.00 | 7.50 | 5.50 | 4.40 | 4.36 | 145.00 | 107.20 | 115.00 | 120.00 | ...... | ...... |

a. Delivered b. Seattle rates plus freight: To Anchorage $55/T. To Fairbanks $80/T. Cement: $30 & $40. Do not incl. wharfage, handling, or 3% transp. cost. c. Plus Dom, Prov. & Mun sales tax. d. FOB warehouse. e. Rolled at Geneva mill, 400-3999 lb. f. 5T or over. g. Per metric ton. h. 3 in. x 15 in. x 12 meters. i. New billet. j. ¾ in x 11 meters. k. FOB plant. l. Bulk. m. Carload lots. Subject to 10c disc. CL price dealers comm. not incl. n. Cash disc. not deducted. o. Paper. p. Tolteca. q. Spruce & hemlock. r. Tax exempt. s. Spruce. t. FOB mill. u. Rail freight from NW to city. $11.50-$15/M f bm. v. CL, direct mill shipment. w. Douglas fir.
Ranges: A. $89-$95. B. $105-$115. C. $125-$135.

### SOUTH AMERICA

| City and Country | Struct. steel /cwt. | | Reinf. steel /cwt. | | Portland cement/bbl. | | Lumber/M f bm 1st cl. pine | | 2nd cl. pine | | Loc. equiv. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dec. | June | Dec. | June | Dec. | June | Dec. | June | Dec. | June | Dec. | June |
| **Bogota** | $18.50 | $12.08 | $16.05 | $9.25[B] | $6.33 | $5.83 | $2.55[d] | $2.55[d] | $2.19[d] | $1.70[d] | $ .... | $ .... |
| **Lima** | 6.95 | 6.05 | 6.35 | 4.23 | 1.90 | 1.70 | 186.00 | 200.00 | 173.00 | 167.00 | 160.00 | 147.00 |
| **Rio de Janeiro** | 9.98 | 9.25 | 10.20[b] | 10.20[b] | 5.46 | 4.26 | .14[f] | .13[f] | .10[f] | .11[f] | ...... | ...... |
| **Santiago** | 10.88 | 11.97 | 7.07 | 7.80 | 4.26 | 4.26 | 200.00[g] | 124.00[g] | 94.00[g] | 84.00[g] | 94.00[g] | 60.00[g] |
| **Buenos Aires**[a] | 4.79 | 5.80 | 4.63 | 5.29 | 11.94 | 17.05 | 219.55[h] | 185.19[h] | 148.05[i] | 113.48[i] | 176.25[j] | 160.76[j] |

a. Dec. prices based on exch. rate 9.02 p = $1 U.S. June rate 14.2 p = $1 U.S. b. Steel seldom used. Quote for iron rods. c. Per bbl. d. 20 x 20 cm. beam/meter in length. Chuguacá. e. Per ft. L. e. — cedar. f. 1 x 1 x 18 ft. Per sq. ft. g. 1 x 10 in. 1st cl. — Arucaria. 2nd — Insignia. L. e. — Poplar (alamo). h. 3 x 4 in. spruce. i. 1 x 6 in. spruce. j. 1 x 12 in. spruce.
Ranges: A. 10,000-14,000 p. B. $8.25-$9.25.

### EUROPE

| City and Country | Struct. steel /cwt. | | Reinf. steel /cwt. | | Portland cement/bbl. | | Lumber/M f bm 1st cl. pine | | 2nd cl. pine | | Loc. equiv. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dec. | June | Dec. | June | Dec. | June | Dec. | June | Dec. | June | Dec. | June |
| **London** | $2.73[F] | $2.73 | $2.82[H] | $2.71 | $1.83[E] | $1.47 | $135.15 | $135.15 | $119.87 | $119.87 | $119.87 | $119.87 |
| **Stockholm** | 5.25 | 3.85 | 5.39[d] | 3.81 | 2.27[e] | 2.24[e] | 119.25 | 93.60 | 85.68 | 66.25 | ...... | ...... |
| **Madrid** | 16.46 | 16.46 | 13.24 | 13.24 | 5.87 | 5.55 | 216.98 | 216.98 | 205.56 | 205.56 | ...... | ...... |
| **Paris** | 4.80 | 4.79 | 3.24[I] | 3.18[G] | 1.54[f] | 1.27[f] | 61.40 | 46.78 | 53.02 | 34.33 | ...... | ...... |
| **Amsterdam** | 4.39 | 3.19 | 4.30 | 2.89 | 2.00 | 2.00 | ...... | ...... | ...... | ...... | 147.31 | 104.18 |
| **Frankfort** | 4.32 | 3.35 | 4.32 | 3.46 | 2.68 | 2.23 | 107.19 | 68.45 | 95.29 | 53.55 | 83.36 | 53.55 |
| **Milan**[*] | 5.20[L] | 4.99[K] | 5.07 | 4.77[J] | 2.64 | 2.61 | ...... | ...... | 101.23 | 113.06[N] | 60.68 | 60.70[M] |

[*] FOB bldg. site. a. Per long ton. b. Per ton. c. Per 100 kilos (220.46 lb). d. For orders delivered Dec., $6.99 from Swedish mill. e. Wartime subst. still used on many jobs at 59 k/met ton ($1.95/bbl). f. Loose, packed 3,565 fr. ($1.94/bbl.) Dec.; 3,360 fr. ($1.62/bbl) June. g. Per 165 cu. ft. h. Per cu. ft. i. Per sq. meter. L. e. — 3rd cl. pine. j. Per mc. (1.308 cu. yd.).
Ranges: A. 3/5/- — 3/18/- B. 20/13/6 — 21/16/- C. 21/13/6 — 22/11/- D. 9,000 — 9,100 E. $1.53 — $1.83 F. $2.58 — $2.73 G. $2.69 — $3.18 H. $2.71 — $2.82 I. $2.75 — $3.24 J. $4.55 — $4.77 K. $4.77 — $4.99 L. $5.14 — $5.20 M. $54.62 — $30.70 N. $109.53 — $113.06.

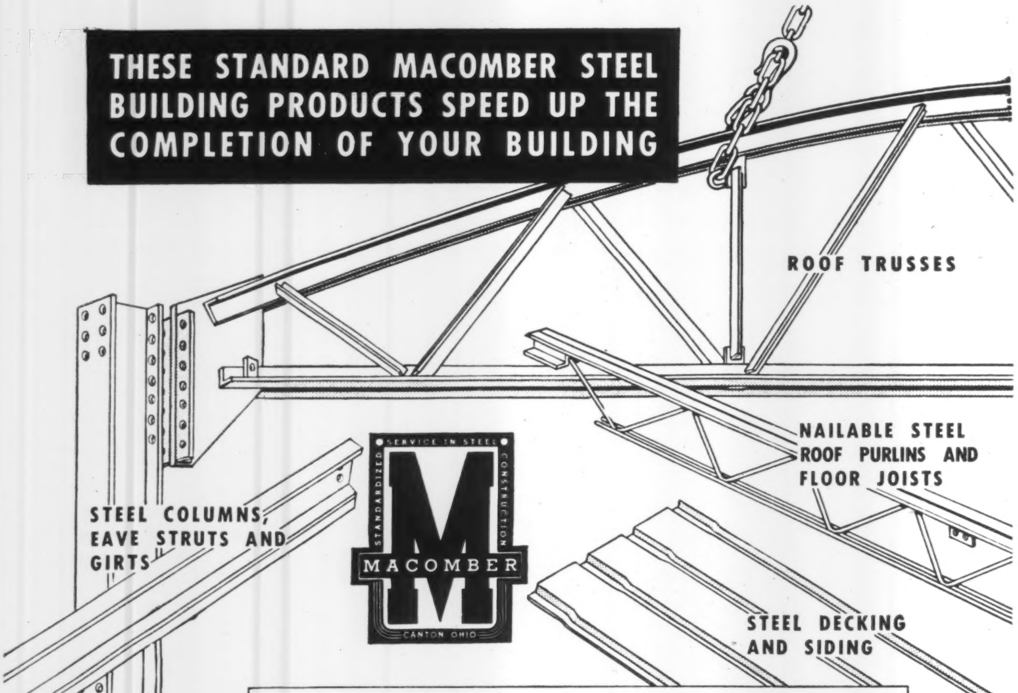
### AFRICA, ASIA, AUSTRALIA

| City and Country | Struct. steel /cwt. | | Reinf. steel /cwt. | | Portland cement/bbl. | | Lumber/M f bm 1st cl. pine | | 2nd cl. pine | | Loc. equiv. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dec. | June | Dec. | June | Dec. | June | Dec. | June | Dec. | June | Dec. | June |
| **Cairo** | $5.56 | $4.01 | $5.04[c] | $3.49[e] | $2.86[B] | $2.86[B] | $171.79 | $156.81 | $157.54 | $121.17 | $124.75[s] | $99.79[s] |
| **Johannesburg** | 6.58 | 5.60 | 6.58 | 5.60 | 2:24 | 2.15 | 148.74[k] | 148.39[k] | 148.74[q] | 154.58[q] | 129.47[t] | 142.21[t] |
| **Haifa**[a] | 10.16 | 10.16 | 6.98 | 6.98 | 4.30 | 4.30 | 266.11 | 266.11 | 224.09 | 224.09 | 161.06[u] | 161.06[u] |
| **Bombay** | 6.54 | 4.31[C] | 3.91 | 3.26 | 3.95 | 3.11 | N.A. | 556.48 | N.A. | 296.79 | 156.35[v] | ...... |
| **Tokyo** | 3.65 | 2.90 | 4.16 | 2.39 | 2.51 | 2.46 | 53.97 | 34.01 | 41.69 | 29.15 | ...... | ...... |
| **Manila**[*] | 7.94 | 7.94 | 6.58 | 6.12 | 6.00 | 6.20 | 130.00[o] | 95.00[o] | 115.00[r] | 90.00[o] | 115.00[w] | ...... |
| **Melbourne** | 2.00[d] | 2.00[A,d] | 2.50[f] | 2.46[f] | 3.01[i] | 2.16[i] | 145.60 | 140.00 | ...... | ...... | 78.40[x] | 62.70[x] |

[*] Delivered. a. Labor union rates quoted. b. Per short ton. c. Per long ton. d. Local. Imported 37/-/- ($3.70/cwt) Dec.; 36/-/- to 48/-/- ($3.60-$4.80) June. e. Local. Imported 42 £E ($5.43/cwt) Dec.; 29 £E ($3.75/cwt) June. f. Local. Imported 50/-/- ($5.00/cwt) Dec.; 34/11/3 ($3.46) June. g. Per 94-lb pocket. h. Per bbl. i. Local. Tasmanian 8/10/- ($3.20/bbl.) Dec. and June. Imported 13/-/- ($4.89/bbl.) Dec.; 11/-/- ($4.14) June. j. 9 x 3 in. running ft. k. Fir. l. Per cu. ft. n. Per koku (10 cu. ft.) o. Apitong. p. Per 100 super ft. (100 bd. ft.) q. Red deal. r. Lauan. s. White wood. t. Pitch pine. u. European spruce. v. 1st cl. Indian teakwood, 2nd cl. 7/- ($128.96). w. Red Lauan. x. Australian hardwood.
Ranges: A. $1.80-$2.00. B. $2.28-$2.86. C. $3.20-$4.31. D. 4.70-5.50 £E.

Tables showing prices in national money with % change from June, 1950 to Dec. 1950 will be furnished free on request to Manager, Business News Department, Engineering News-Record, 330 W. 42nd St., New York 18, N.Y.

# THESE STANDARD MACOMBER STEEL BUILDING PRODUCTS SPEED UP THE COMPLETION OF YOUR BUILDING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## THE THREE-FOLD ADVANTAGES YOU HAVE IN MACOMBER STANDARDIZED STRUCTURAL MEMBERS

DESIGN: Ample latitude in sizes and kinds to meet structural requirements of practically any School, Hospital, Industrial or Commercial building.

ERECTION: Contractors and their men know Macomber products conform to the regular pattern of their work. Macomber steel goes up smoothly, fits into a rigid structural assembly and they are on their way.

OWNERSHIP: There is no more basic way to keep costs down than to use products designed to save material and labor. No steel or wood form work to buy, build or remove. No delay for curing. Macomber construction speeds occupancy.

Add up these fundamentals and you will choose Macomber.

**STANDARDIZED STEEL BUILDING PRODUCTS**

# MACOMBER • INCORPORATED

CANTON, OHIO

V BAR JOISTS • LONGSPANS • BOWSTRING TRUSSES • STEEL DECK

# High cost of construction accidents and injuries

Accidents and injuries in 1948 cost construction $770 million, according to estimates of the U. S. Bureau of Labor Statistics. Ranging from fatalities down to temporary total disabilities these are analyzed by BLS in the accompanying tables:

# Work injuries in construction

| Construction | 1948 | 1949 | 1950 |
|---|---|---|---|
| I All disabilities, Total | 193,000 | 183,000 | 205,000 |
| to employees | 150,000 | 142,000 | 159,000 |
| II Fatalities, Total | 2,100 | 2,100 | 2,300 |
| to employees | 1,700 | 1,700 | 1,800 |
| III Permanent-total, Total | 300 | 300 | 300 |
| to employees | 200 | 200 | 200 |
| IV Perm-partial, Total | 7,800 | 7,300 | 8,200 |
| to employees | 6,000 | 5,700 | 6,400 |
| V Temporary-total, Total | 182,800 | 173,300 | 194,200 |
| to employees | 142,100 | 134,400 | 150,600 |

(Based on small sample studies by BLS)

# Work injury rates in construction, 1948–1949—reported by BLS

(Frequency rate is average number of disabling injuries per million hours worked.
Severity rate is average number of days lost per thousand hours worked)

| | Frequency rates | | | | | | | | Severity | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I—All | | II—Death & perm. total | | III—Perm. partial | | IV—Temp. total | | Disab. | | Temp. total | | Sever. rate | |
| Industry | '48 | '49 | '48 | '49 | '48 | '49 | '48 | '49 | '48 | '49 | '48 | '49 | '48 | '49 |
| Total | 36.7 | 39.8 | .4 | .3 | 1.5 | 1.3 | 34.8 | 38.2 | 135 | ... | 14 | ... | 5.0 | 3.9 |
| General contractors: | | | | | | | | | | | | | | |
| Bldg constr | 39.0 | 40.8 | .4 | .2 | 1.1 | 1.1 | 37.5 | 39.5 | 101 | ... | 13 | ... | 3.9 | 3.1 |
| Heavy & marine constr | 39.2 | 41.8 | .6 | .5 | 1.5 | 1.2 | 37.1 | 40.1 | 148 | ... | 15 | ... | 5.8 | 5.5 |
| Hwy & st constr | 43.3 | 45.5 | .6 | .4 | 1.3 | 1.2 | 41.4 | 43.9 | 126 | ... | 13 | ... | 5.5 | 4.7 |
| Special-trade contractors: | | | | | | | | | | | | | | |
| Carpentering | 34.3 | 29.3 | .3 | N.A. | 2.2 | N.A. | 31.8 | N.A. | 135 | ... | 13 | ... | 4.6 | .7 |
| Concrete wk | 28.2 | 34.1 | .3 | N.A. | .7 | N.A. | 27.2 | N.A. | 136 | ... | 17 | ... | 3.8 | .4 |
| Electrical wk | 21.2 | 28.3 | .4 | .2 | .9 | .2 | 19.9 | 27.9 | 204 | ... | 15 | ... | 4.3 | 1.9 |
| Excav & fndn wk | 31.3 | 36.4 | .1 | N.A. | 1.5 | N.A. | 29.7 | N.A. | 89 | ... | 14 | ... | 2.8 | 1.2 |
| Gen'l bldg maint | 20.0 | .... | 1.1 | .... | .5 | .... | 18.4 | .... | 343 | ... | 21 | ... | 6.9 | ... |
| Glass & glazing | 33.7 | .... | .... | .... | .9 | .... | 32.8 | .... | 42 | ... | 11 | ... | 1.4 | ... |
| House moving | 33.1 | .... | 1.8 | .... | .9 | .... | 30.4 | .... | 343 | ... | 12 | ... | 11.4 | ... |
| Instal of machy & equip, nec | 46.7 | 37.7 | .3 | .5 | 8.7 | 8.3 | 37.7 | 28.9 | 161 | ... | 14 | ... | 7.5 | 2.5 |
| Insulation wk | 32.7 | .... | .2 | .... | .8 | .... | 31.7 | .... | 61 | ... | 13 | ... | 2.0 | ... |
| Masonry & stone wk | 36.9 | 29.4 | .1 | N.A. | .7 | N.A. | 36.1 | N.A. | 76 | ... | 12 | ... | 2.8 | .5 |
| Ornam iron & st wk[a] | 49.4 | 48.6 | .7 | .7 | 3.4 | 4.2 | 45.3 | 43.7 | 161 | ... | 14 | ... | 8.0 | 13.6 |
| Paint, paper hang, & decor | 19.2 | 17.8 | .4 | N.A. | 1.2 | N.A. | 17.6 | N.A. | 239 | ... | 18 | ... | 4.6 | 7.6 |
| Parquet & hrdwd-fl wk | 15.9 | .... | .3 | .... | .6 | .... | 15.0 | .... | 147 | ... | 22 | ... | 2.3 | ... |
| Plastering & lathing | 39.0 | 42.7 | .2 | .... | 1.0 | 2 | 37.8 | 42.5 | 82 | ... | 13 | ... | 3.2 | 1.1 |
| Plumb, heat, & air cond | 30.6 | 31.1 | .2 | .... | 1.2 | .7 | 29.2 | 30.4 | 112 | ... | 11 | ... | 3.4 | 1.2 |
| Roof & sheet metal wk | 40.0 | 32.6 | .3 | .1 | .9 | .8 | 38.8 | 31.7 | 102 | ... | 13 | ... | 4.1 | 2.5 |
| Struct-steel wk[a] | 52.4 | .... | 1.2 | .... | 4.5 | .... | 46.7 | .... | 293 | ... | 21 | ... | 15.4 | ... |
| Trzo, tile, marble, & mosaic wk | 19.4 | 27.1 | .3 | N.A. | 1.0 | N.A. | 18.1 | N.A. | 205 | ... | 13 | ... | 4.0 | 8.3 |
| Wrecking & demol wk[b] | 58.3 | .... | .3 | .... | 2.8 | .... | 55.2 | .... | 90 | ... | 14 | ... | 5.2 | ... |
| Special-trade contractors, other[b] | .... | 39.8 | .... | 1.4 | .... | .6 | .... | 38.8 | ... | ... | ... | ... | ... | 4.0 |

[a] 1949 rates incl. ornam. iron & st wk and struct-st wk.
[b] 1949 rates incl. wrecking & demol wk and special-trade contractors, other.

# Wage rates—New York City

Dollars per hour

| Year | Carpenters | Bricklayers | Masons' Laborers | Common Laborers | Structural Ironwkrs |
|---|---|---|---|---|---|
| 1874... | $0.23<br>(10 hrs.) | $0.43<br>(8 hrs.) | $0.18<br>(8 hrs.) | $0.14<br>(10 hrs.) | ..... |
| 1890... | .43<br>(8 hrs.) | .47<br>(8 hrs.) | .28<br>(8 hrs.) | .14<br>(9 hrs.) | .....<br>(8 hrs.) |
| 1907... | .63 | .70 | .38 | .22<br>(8 hrs.) | $0.60 |
| 1913... | .63 | .70 | .38 | .23 | .63 |
| 1930... | 1.65 | 1.93 | 1.03 | 1.03 | 1.93 |
| 1932... | 1.33<br>(7 hrs.) | 1.47<br>(7 hrs.) | 1.00<br>(7 hrs.) | .65 | 1.68 |
| 1938... | 1.75 | 1.89 | 1.00 | .91 | 1.93 |
| 1939... | 1.75 | 1.89 | 1.03 | .91 | 1.93 |
| 1942... | 1.85 | 2.00 | 1.03 | .95 | 2.00 |
| 1946... | 2.10 | 2.25 | 1.23 | 1.20 | 2.25 |
| 1947... | 2.47 | 2.65 | 1.44 | 1.44 | 2.56 |
| 1948... | 2.73 | 2.94 | 1.62 | 1.63 | 2.98 |
| 1949... | 2.75 | 3.20 | 1.70 | 1.70 | 3.00 |
| 1950... | 2.88 | 3.30 | 1.78 | 1.78 | 3.14 |

In addition, in their 1951-agreements New York workers got these benefits:

- **WELFARE:** 3%—carpenters, bricklayers, struct. iron workers, reinf. iron workers,* sheet metal workers,* common labor, plasterers, mosaic & terrazzo,* cement finishers,* lathers,* glaziers,* plumbers & steamfitters,* roofers,* waterproofers,* welders, hoisting engineers, shovel operators;
4%—mason's helpers, painters; 4% welfare and pension—electricians.

* Also 3% pension.

- **PENSION:** 2% — mason's helpers, plumbers; 3%—see welfare; 20¢ hr—bricklayers, plasterers.
- **PAID HOLIDAYS:** 6 ea—carpenters, struct. iron workers, common labor, electricians, welders, hoisting engineers, shovel operators.

**HOSPITAL & HEALTH:** 4%—stone masons, tile layers (5% effective 7/5/51 for both); 8%—plumbers in Manhattan and Bronx.

**COST OF LIVING ESCALATORS:** most trades.

# Cost of living index

The increasing use of the consumers' price index for adjusting wage rates under escalator agreements has focused interest in this service by the Bu. of Labor Statistics. That agency is engaged in reweighting the index and adjusting it for changes in rent conditions and introduction of new commodities.

Both the new and the old consumers price indexes have been announced by the Bu. of Labor Statistics.

The old index for January is 181.6 adding 1.3 for rent correction this gives a total of 182.9.

The new consumers price index as announced by BLS is 181.5 plus .8 rent allowance, or 182.3.

The old index is shown in the table.

# Consumers' price index

U. S. Bu. of Labor Statistics, 1935 — '39 = 100

| | 1939 | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 |
|---|---|---|---|---|---|---|---|
| January | .... | 127.1 | 129.9 | 153.3 | 168.8 | 170.9 | 166.9 |
| February | .... | 126.9 | 129.6 | 153.2 | 167.5 | 169.0 | 166.5 |
| March | 99.2 | 126.8 | 130.2 | 156.3 | 166.9 | 169.5 | 167.0 |
| April | .... | 127.1 | 131.1 | 156.2 | 169.3 | 169.7 | 167.3 |
| May | .... | 128.1 | 131.7 | 156.0 | 170.5 | 169.2 | 168.6 |
| June | 98.2 | 129.0 | 133.3 | 157.1 | 171.7 | 169.6 | 170.2 |
| July | .... | 129.4 | 141.2 | 158.4 | 173.7 | 168.5 | 172.5 |
| August | .... | 129.3 | 144.1 | 160.3 | 174.5 | 168.8 | 173.0 |
| September | 101.3 | 128.9 | 145.9 | 163.8 | 174.5 | 169.6 | 173.8 |
| October | .... | 128.9 | 148.6 | 163.8 | 173.6 | 168.5 | 174.8 |
| November | .... | 129.3 | 152.2 | 164.9 | 172.2 | 168.6 | 175.6 |
| December | 100.1 | 129.9 | 153.3 | 167.0 | 171.4 | 167.5 | 178.4 |

**1926** June, 124.1, Dec., 124.5 **1932** June, 101.1, Dec., 97.3.

# Canadian index of basic construction costs

By Central Mortgage & Housing Corp.— 1939 = 100.

| | | 1949 | | 1950 | |
|---|---|---|---|---|---|
| 1945 | 137.8 | Jan | 208.7 | Jan | 209.4 |
| 1946 | 147.7 | Apr | 209.7 | Jul | 227.3 |
| 1947 | 173.6 | Jul | 209.3 | Nov | 233.0 P |
| 1948 | 200.0 | Oct | 209.6 | | |
| 1949 | 208.1 | | | P | Prelim |

Weighted index of wholesale prices and wage rates including vacation pay allowances. Intangibles, productivity, etc., not included.

# Canadian wage and cost of living changes—1939-'49

Unweighted average wage increases for 8 principal construction occupations (including vacation pay allowances)

| | Wages, % | | | | Cost of living, % | | | |
|---|---|---|---|---|---|---|---|---|
| Increase in City | '39–'49 | '47–'48 | '48–'49 | '49–'50 | '39–'49 | '47–'48 | '48–'49 | '49–'50 |
| Vancouver | 92.8 | 14.3 | 3.2 | 4.8 | 61.9 | 10.1 | 0.7 | 6.6 |
| Edmonton | 79.9 | 9.6 | 9.8 | 3.5 | 56.4 | 9.8 | 1.8 | 6.4 |
| Saskatoon | 96.4 | 14.2 | 6.9 | 3.1 | 62.7 | 9.6 | 0.7 | 4.2 |
| Winnipeg | 67.6 | 5.5 | 5.2 | 5.3 | 55.7 | 8.1 | 2.3 | 6.7 |
| Toronto | 97.1 | 10.8 | 5.9 | 10.5 | 57.4 | 7.3 | 1.9 | 6.2 |
| Montreal | 89.6 | 11.7 | 3.4 | 11.6 | 64.1 | 8.7 | 1.6 | 6.8 |
| St John | 89.9 | 11.0 | 5.2 | 5.0 | 58.0 | 8.1 | 1.6 | 6.1 |
| Halifax | 74.6 | 13.1 | 2.6 | 1.5 | 53.6 | 6.3 | 1.9 | 3.5 |
| Aver. 8 cities | 86.0 | 11.3 | 5.3 | 5.7 | 58.7 | 8.4 | 1.6 | 5.8 |

# Canadian wage rates for 8 building trades in 11 cities

Rates from Dominion Department of Labour, and Canadian Construction Association

| | Bricklayers | | | Carpenters | | | Electricians | | | Painters | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1939J | 1945J | 1950D | 1939J | 1945J | 1950D | 1939J | 1945J | 1950D | 1939J | 1945J | 1950D |
| Halifax | $1.00 | $1.15 | $1.44 | $.70 | $.95 | $1.23 | $.85 | $1.06 | $1.23 | $.60 | $.81 | $1.10 |
| Saint John | .90 | 1.10 | 1.60 | .50–.60 | .81 | 1.13 | .50–.65 | .85 | 1.25 | .50–.55 | .76 | 1.00 |
| Quebec | .75–.85 | 1.00 | 1.30 | .55–.60 | .80 | 1.10 | .55–.65 | .80 | 1.10 | .50–.55 | .75 | 1.05 |
| Montreal | .80–.90 | 1.06 | 1.60–1.80 | .70 | .96 | 1.40 | .75 | 1.01 | 1.50 | .66 | .86 | 1.30 |
| Toronto | 1.00 | 1.23 | 2.00–2.25 | .90 | 1.11 | 1.80 | 1.00 | 1.21 | 1.85 | .75 | .97 | 1.50 |
| Hamilton | .90 | 1.19 | 1.80 | .75 | 1.04 | 1.60 | .75 | 1.05 | 1.65 | .65 | .86 | 1.20 |
| Windsor | 1.15 | 1.26 | 1.85 | .95 | 1.18 | 1.70 | 1.15 | 1.26 | 1.92 | .60–.65 | .95 | 1.35 |
| Winnipeg | 1.10 | 1.25 | 1.75 | .85 | 1.05 | 1.50 | .85 | 1.05 | 1.50 | .70 | .90 | 1.20 |
| Saskatoon | 1.00 | 1.20 | 1.75 | .50–.75 | .96 | 1.42 | .70–.80 | .93 | 1.40 | .50–.70 | .70 | 1.18 |
| Edmonton | 1.10 | 1.31 | 1.80 | .90 | 1.03 | 1.52½ | .85 | 1.06 | 1.70 | .80 | .91 | 1.35 |
| Vancouver | 1.10 | 1.29 | 1.88 | .75–.90 | 1.12 | 1.68 | .75–1.00 | 1.19 | 1.78 | .63–.80 | .97 | 1.50 |

| | Plasterers | | | Plumbers | | | Sheetmetal Workers | | | Labourers | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1939J | 1945J | 1950D | 1939J | 1945J | 1950D | 1939J | 1945J | 1950D | 1939J | 1945J | 1950D |
| Halifax | $.80 | $.95 | $1.35 | $.85 | $1.02½ | $1.30 | $.70 | $.85 | $1.13 | .30–.40 | $.52 | $.81–.90 |
| Saint John | .90 | 1.10 | 1.60 | .60–.70 | .88 | 1.25 | .50–.65 | .81 | 1.20 | .30–.40 | .53 | .65–.90 |
| Quebec | .75 | 1.00 | 1.30 | .55–.65 | .80 | 1.10 | .55–.65 | .80 | 1.10 | 40 | .60 | .80 |
| Montreal | .80 | 1.06 | 1.60–1.80 | .75 | 1.01 | 1.58 | .65–.75 | .96 | 1.40 | .40 | .61 | .85 |
| Toronto | .90 | 1.21 | 2.00 | 1.00 | 1.17 | 1.85 | .93 | 1.18 | 1.85 | .35–.50 | .67 | 1.05-1.15 |
| Hamilton | .90 | 1.07 | 1.90 | .85 | 1.07 | 1.70 | .75 | 1.04 | 1.65 | .35–.45 | .65 | .85–1.05 |
| Windsor | .90 | 1.15 | 1.70 | 1.00 | 1.25 | 1.85 | .70–.85 | 1.06 | 1.65 | .55 | .75 | 1.15-1.35 |
| Winnipeg | 1.10 | 1.25 | 1.75 | .95 | 1.15 | 1.65 | .70 | .85 | 1.10 | .40–.45 | .63 | 85–.95 |
| Saskatoon | .75–1.00 | 1.06 | 1.75 | 1.00 | 1.06 | 1.50 | .75–.90 | .81–.85 | 1.35 | .30–.40 | .58 | .85 |
| Edmonton | 1.05 | 1.31 | 1.85 | 1.05 | 1.16 | 1.70 | .90 | 1.07 | 1.55 | .40–.50 | .61 | .98 |
| Vancouver | 1.00 | 1.10 | 1.85 | 1.00 | 1.19 | 1.75 | 1.00 | 1.18 | 1.80 | .45–.50 | .71 | 1.23 |

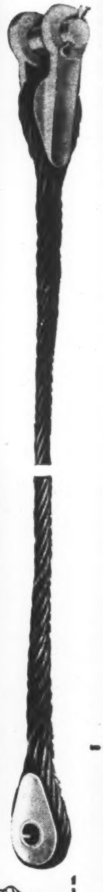
J—June 1 D—Dec. 1

Note: Vacation Pay Assessments for above trades are as follows: Montreal—2%, Toronto—4% (except for painters and sheetmetal workers), Hamilton—2-4%, Windsor—4%, Winnipeg—2%, Saskatoon—4%, Edmonton—4%, Vancouver—2½%.

# Put safety and reliability into your boom supports

*with new Fatigue-Resistant*

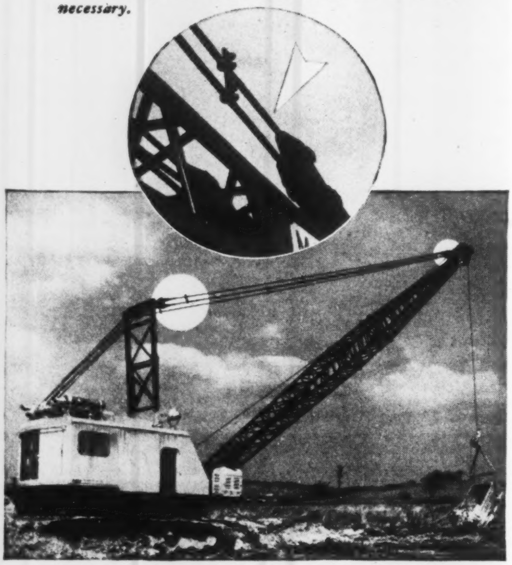
## TIGER BRAND WIRE ROPE ASSEMBLIES



••••••••••▶ *An exclusive development of American Steel and Wire Company*

### HERE'S THE TROUBLE SPOT

On old style boom supports, vibration was concentrated at the point where the wire rope entered the socket. For machines where vibration was *not* severe, this assembly was satisfactory. But for today's high-power, high-speed machines, *a boom support with much greater resistance to fatigue is absolutely necessary.*



### HOW THE TROUBLE WAS ELIMINATED

The New Fatigue-Resistant Tiger Brand Wire Rope Assemblies are an *innovation.* They effectively combat the most severe vibration on power shovels, draglines and cranes. Note carefully the novel end thimble interwoven into the pendant. Vibration is dampened over a long section instead of being concentrated at one point.

### 2 TO 3 TIMES LONGER LIFE

The new construction has been proved in actual operation to last two to three times longer than the old assemblies — and in some cases even better results were obtained.

### INTERCHANGEABLE ON STANDARD EQUIPMENT

You can replace your old boom supports with these new assemblies quickly and easily because essential dimensions such as pin diameters, distance between ears, etc. are the same as for standard open and closed sockets. Send the coupon for complete information.

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Rockefeller Building, Dept. A-3
Cleveland 13, Ohio

Please send me complete information on your new Tiger Brand Boom Support Assemblies.

Name..........................................

Title..........................................

Company..........................................

Address..........................................

City.......................................State..............

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE UNITED STATES STEEL

## AMERICAN TIGER BRAND WIRE ROPE

*Excellay Preformed*

UNITED STATES STEEL

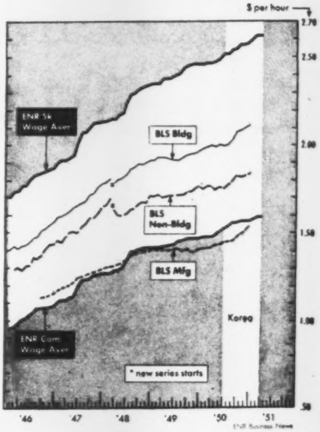
# Construction wages—ENR 20-cities averages

**SKILLED LABOR** (Dollars per Hour)
(Bricklayer, carpenter, ironworker average)

| | 1926 | 1932 | 1939 | 1945 | 1946 | 1948 | 1949 | 1950 | 1951 |
|---|---|---|---|---|---|---|---|---|---|
| J | 1.24 | 1.15 | 1.43 | 1.64 | 1.70 | 2.14 | 2.35 | 2.46 | 2.604 |
| F | 1.24 | 1.11 | 1.43 | 1.64 | 1.73 | 2.15 | 2.35 | 2.47 | 2.615 |
| M | 1.24 | 1.11 | 1.43 | 1.64 | 1.74 | 2.15 | 2.38 | 2.47 | 2.619 |
| A | 1.25 | .95 | 1.44 | 1.65 | 1.76 | 2.17 | 2.38 | 2.48 | ..... |
| M | 1.26 | .96 | 1.44 | 1.65 | 1.77 | 2.18 | 2.38 | 2.48 | ..... |
| J | 1.27 | .99 | 1.44 | 1.66 | 1.80 | 2.25 | 2.39 | 2.52 | ..... |
| J | 1.27 | 1.00 | 1.44 | 1.66 | 1.82 | 2.29 | 2.41 | 2.52 | ..... |
| A | 1.28 | .98 | 1.44 | 1.67 | 1.83 | 2.30 | 2.44 | 2.54 | ..... |
| S | 1.28 | .99 | 1.44 | 1.67 | 1.84 | 2.32 | 2.45 | 2.55 | ..... |
| O | 1.29 | .98 | 1.44 | 1.67 | 1.85 | 2.33 | 2.46 | 2.56 | ..... |
| N | 1.29 | .97 | 1.46 | 1.68 | 1.86 | 2.34 | 2.46 | 2.57 | ..... |
| D | 1.29 | .98 | 1.46 | 1.68 | 1.87 | 2.35 | 2.46 | 2.58 | ..... |
| **Av.** | **1.27** | **1.02** | **1.44** | **1.66** | **1.80** | **2.25** | **2.41** | **2.52** | ..... |

**COMMON LABOR** (Dollars per Hour)
(Building and heavy construction average)

| | 1926 | 1932 | 1939 | 1945 | 1946 | 1948 | 1949 | 1950 | 1951 |
|---|---|---|---|---|---|---|---|---|---|
| J | .54 | .452 | .682 | .891 | .952 | 1.272 | 1.417 | 1.485 | 1.585 |
| F | .54 | .452 | .680 | .891 | .968 | 1.272 | 1.417 | 1.485 | 1.593 |
| M | .543 | .436 | .680 | .895 | .988 | 1.283 | 1.424 | 1.486 | 1.595 |
| A | .543 | .412 | .683 | .904 | 1.004 | 1.287 | 1.428 | 1.493 | .... |
| M | .55 | .411 | .682 | .909 | 1.018 | 1.300 | 1.431 | 1.511 | .... |
| J | .55 | .412 | .684 | .916 | 1.034 | 1.352 | 1.441 | 1.528 | .... |
| J | .553 | .411 | .684 | .916 | 1.058 | 1.394 | 1.465 | 1.538 | .... |
| A | .555 | .422 | .685 | .916 | 1.071 | 1.394 | 1.470 | 1.561 | .... |
| S | .555 | .431 | .685 | .917 | 1.072 | 1.401 | 1.478 | 1.561 | .... |
| O | .55 | .431 | .685 | .917 | 1.073 | 1.413 | 1.478 | 1.568 | .... |
| N | .555 | .426 | .685 | .917 | 1.078 | 1.413 | 1.478 | 1.574 | .... |
| D | .555 | .427 | .685 | .938 | 1.085 | 1.413 | 1.478 | 1.574 | .... |
| **Av.** | **.548** | **.4269** | **.683** | **.910** | **1.033** | **1.350** | **1.450** | **1.530** | .... |



Construction wage rates during the past year went up 7% for common labor and 6% for skilled. This compares with a rise of 4% in the preceding year. Some of this increase was taken in benefits instead of in cash. A major swing to benefit agreements with building trades featured the year's wage bargaining. These included paid holidays, paid vacation, welfare funds, pension funds and cost of living escalator clauses that work automatically with the Bureau of Labor Statistics Consumer Price Index.

March usually opens the new bargaining season, with new contracts pouring in during April, May and June and others trickling in in July, August and September and with a few coming along in the rest of the year. But—on Jan. 26, 1951, a simultaneous price-wage freeze was clamped on all business by the Economic Stabilization Adm. This fixed prices and wages at the highest rate charged between Dec. 19, 1950 and Jan. 25, 1951, except for wage increases already contracted for.

Early in March, 1951 these loopholes for wages were issued by ESA: unions can insist on 10% over Jan. 15, 1950 rates. On top of that, they can get the 4-cent annual improvement factor next June. They can also go above 10% on cost-of-living escalator clauses. And neither pensions nor other fringe benefits are charged against the 10% limit on wage increases. Industry now is balking at this wage policy.

# Average hourly earnings reported by USBLS

| | Building | | | | | Non-Building | | | | | Manufacturing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1946 | 1947 | 1948 | 1949 | 1950 | 1946 | 1947 | 1948 | 1949 | 1950 | 1946 | 1947 | 1948 | 1949 | 1950 |
| Jan | 1.402 | 1.594 | 1.781 | 1.918 | 1.976 | .... | 1.451 | 1.676 | 1.710 | 1.753 | .... | 1.174 | 1.302 | 1.405 | 1.418 |
| Feb | 1.422 | 1.598 | 1.806 | 1.930 | 1.988 | 1.296 | 1.441 | 1.700 | 1.714 | 1.771 | .... | 1.184 | 1.308 | 1.401 | 1.420 |
| Mar | 1.411 | 1.610 | *1.786 | 1.933 | 1.995 | 1.300 | 1.473 | *1.628 | 1.703 | 1.766 | .... | 1.195 | 1.310 | 1.400 | 1.424 |
| Apr | 1.423 | 1.634 | 1.804 | 1.934 | 1.996 | 1.283 | 1.499 | 1.600 | 1.709 | 1.746 | .... | 1.202 | 1.314 | 1.401 | 1.434 |
| May | 1.431 | 1.656 | 1.815 | 1.930 | 1.998 | 1.308 | 1.508 | 1.600 | 1.712 | 1.762 | .... | 1.224 | 1.324 | 1.401 | 1.442 |
| June | 1.444 | 1.661 | 1.836 | 1.923 | 1.995 | 1.313 | 1.501 | 1.614 | 1.712 | 1.756 | .... | 1.244 | 1.340 | 1.405 | 1.453 |
| July | 1.473 | 1.669 | 1.862 | 1.922 | 2.006 | 1.357 | 1.536 | 1.634 | 1.712 | 1.776 | .... | 1.249 | 1.356 | 1.408 | 1.462 |
| Aug | 1.482 | 1.689 | 1.874 | 1.932 | 2.031 | 1.353 | 1.554 | 1.639 | 1.713 | 1.793 | .... | 1.255 | 1.373 | 1.398 | 1.463 |
| Sept | 1.510 | 1.718 | 1.895 | 1.940 | 2.076 | 1.372 | 1.588 | 1.663 | 1.733 | 1.825 | 1.130 | 1.267 | 1.386 | 1.407 | 1.480 |
| Oct | 1.526 | 1.738 | 1.892 | 1.943 | 2.083 | 1.403 | 1.596 | 1.672 | 1.736 | 1.818 | 1.135 | 1.274 | 1.390 | 1.392 | 1.501 |
| Nov | 1.549 | 1.765 | 1.906 | 1.947 | 2.100 | 1.433 | 1.615 | 1.671 | 1.751 | 1.830 | 1.146 | 1.285 | 1.397 | 1.391 | 1.514 |
| Dec | 1.569 | 1.777 | 1.915 | 1.973 | .... | 1.434 | 1.645 | 1.712 | 1.777 | .... | 1.157 | 1.295 | 1.400 | 1.412 | 1.542 |

* Series revised to cover both public and private contract construction and to include workers engaged in off-site operations for construction as well as site workers.

# Average earnings and hours

| U. S. AVERAGE NOVEMBER | Hourly earnings 1949 | Hourly earnings 1950 | Weekly hours 1949 | Weekly hours 1950 |
|---|---|---|---|---|
| **Total building** | **$1.948** | **$2.100** | **38.1** | **37.3** |
| **All building trades** | 2.056 | ..... | 36.5 | .... |
| **Plumb & heating** | 2.085 | 2.188 | 37.5 | 38.6 |
| **Paint & decoration** | 1.996 | 2.075 | 34.5 | 36.1 |
| **Electrical** | 2.241 | 2.448 | 38.2 | 39.2 |
| **Masonry** | 2.047 | 2.182 | 35.0 | 36.0 |
| **Plaster & lath** | 2.302 | 2.501 | 32.5 | 36.6 |
| **Carpentry** | 1.915 | 1.896 | 36.3 | 38.1 |
| **Roof & sheet met** | 1.769 | 1.847 | 36.1 | 37.2 |
| **Excav & found** | 1.864 | 2.121 | 37.1 | 39.1 |
| **Total non-building** | 1.751 | 1.830 | 39.9 | 41.0 |
| **Highway & street** | 1.605 | 1.710 | 40.7 | 41.4 |
| **Heavy construction** | 1.858 | ..... | 39.7 | .... |
| **Other** | 1.831 | 1.919 | 38.4 | 40.7 |

# Skilled and common wage rates in 20 cities

**From monthly reports by Engineering News-Record, per hour, 8-hr. day.**

| ENR 20-Cities | Hrs per day | Bricklayers 1950 low | aver | high | Mar. '51 | Carpenters 1950 low | aver | high | Mar. '51 | Structural ironworkers 1950 low | aver | high | Mar. '51 | Common labor (Av bldg & heavy constr) 1950 low | aver | high | Mar. '51 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Atlanta** | 8 | 2.50 | 2.50 | 2.50 | 2.50 | 1.85 | 1.86 | 2.00 | 2.00 | 2.125 | 2.177 | 2.25 | 2.25 | .90 | .962 | 1.025 | 1.05 |
| **Baltimore** | 8 | 3.00 | 3.00 | 3.00 | 3.00 | 2.20 | 2.31 | 2.35 | 2.35 | 2.55 | 2.625 | 2.65 | 2.65 | 1.25 | 1.316 | 1.35 | 1.35 |
| **Birmingham** | 8 | 2.50 | 2.56 | 2.75 | 2.75 | 1.90 | 1.94 | 2.035 | 2.125 | 2.20 | 2.225 | 2.30 | 2.35 | 1.05 | 1.075 | 1.15 | 1.15 |
| **Boston** | 8 | 2.625 | 2.725 | 2.775 | 2.775 | 2.25 | 2.29 | 2.375 | 2.375 | 2.55 | 2.562 | 2.70 | 2.70 | 1.65 | 1.716 | 1.75 | 1.75 |
| **Chicago** | 8 | 2.55 | 2.59 | 2.625[a] | 2.625 | 2.45 | 2.50 | 2.55 | 2.55 | 2.50 | 2.558 | 2.60 | 2.60 | 1.80 | 1.858 | 1.90 | 1.90[c] |
| **Cincinnati** | 8 | 2.575 | 2.637 | 2.70 | 2.70 | 2.25 | 2.25 | 2.275 | 2.325 | 2.425 | 2.427 | 2.45 | 2.45 | 1.535 | 1.592 | 1.65 | 1.65 |
| **Cleveland** | 8 | 2.575 | 2.668 | 2.70 | 2.70[b] | 2.575 | 2.648 | 2.70 | 2.825 | 2.575 | 2.668 | 2.70 | 2.825 | 1.788 | 1.887 | 1.92 | 1.975 |
| **Dallas** | 8 | 2.50 | 2.50 | 2.50 | 3.125 | 2.125 | 2.125 | 2.125 | 2.25 | 2.25 | 2.25 | 2.25 | 2.50 | 1.283 | 1.283 | 1.283 | 1.275 |
| **Denver** | 8 | 3.00 | 3.00 | 3.00 | 3.00 | 2.10 | 2.20 | 2.35 | 2.35 | 2.10 | 2.14 | 2.20 | 2.25 | 1.375 | 1.418 | 1.50 | 1.50 |
| **Detroit** | 8 | 2.625 | 2.725 | 2.85 | 2.85 | 2.325 | 2.44 | 2.60 | 2.60 | 2.575 | 2.664 | 2.80 | 2.85[c] | 1.675 | 1.775 | 1.90 | 1.90 |
| **Kansas City** | 8 | 2.60 | 2.637 | 2.675 | 2.675 | 2.15 | 2.187 | 2.225 | 2.225 | 2.30 | 2.337 | 2.375 | 2.375 | 1.575 | 1.612 | 1.65 | 1.65 |
| **Los Angeles** | 8 | 2.625 | 2.697 | 2.75 | 2.75 | 2.12 | 2.153 | 2.20 | 2.35 | 2.30 | 2.41 | 2.50 | 2.50 | 1.57 | 1.603 | 1.65 | 1.75 |
| **Minneapolis** | 8 | 2.40 | 2.40 | 2.40 | 2.40 | 2.12 | 2.12 | 2.12 | 2.12 | 2.275 | 2.275 | 2.275 | 2.275 | 1.52 | 1.52 | 1.52 | 1.52 |
| **New Orleans** | 8 | 2.50 | 2.558 | 2.60 | 2.60 | 1.875 | 1.93 | 1.975 | 1.975 | 2.25 | 2.308 | 2.35 | 2.35 | 1.025 | 1.068 | 1.10 | 1.10 |
| **New York** | 7 | 3.20 | 3.299[d] | 3.548[d] | 3.548[d] | 2.75 | 2.88 | 3.09[e] | 3.09[e] | 3.00 | 3.136 | 3.348[e,f] | 2.348[e,f] | 1.70 | 1.783 | 1.90 | 1.90 |
| **Philadelphia** | 8 | 3.00 | 3.195[g] | 3.31[g] | 3.31[g] | 2.37 | 2.46 | 2.525 | 2.525 | 2.65 | 2.79 | 2.89[h] | 2.89[h] | 1.525 | 1.583 | 1.625 | 1.625 |
| **Pittsburgh** | 8 | 3.00 | 3.00 | 3.00 | 3.00 | 2.50 | 2.587 | 2.65 | 2.65 | 2.625 | 2.625 | 2.625 | 2.625 | 1.50 | 1.55 | 1.60 | 1.60 |
| **St. Louis** | 8 | 2.833[i] | 2.96[i] | 3.09[i] | 3.09[i] | 2.45 | 2.475 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 1.613 | 1.642 | 1.663 | 1.688 |
| **San Francisco** | 8 | 2.813[j] | 2.968[j] | 3.00[j] | 3.25[k] | 2.225 | 2.287 | 2.375 | 2.375 | 2.50 | 2.50 | 2.50 | 2.575 | 1.55 | 1.55 | 1.55 | 1.65 |
| **Seattle** | 8 | 3.00 | 3.00 | 3.00 | 3.25 | 2.195 | 2.195 | 2.195 | 2.30 | 2.395 | 2.395 | 2.395 | 2.50 | 1.813 | 1.813 | 1.813 | 1.925 |
| **Montreal** | ... | 1.40 | 1.48 | 1.60 | 1.60 | 1.25 | 1.31 | 1.40 | 1.40 | 1.25 | 1.35 | 1.50 | 1.50 | .85 | .881 | .925 | .925 |

[a] incl. 7.5¢ welfare fund, Chicago. [b] still negotiating, Cleveland. [c] incl. 5¢ welfare fund, Chicago and Detroit. [d] incl. 3% welfare plus 20¢ pension fund, New York. [e] incl. 3% welfare fund, New York. [f] 8-hr day, New York. [g] incl. 2% welfare fund, Philadelphia. [h] incl. 9¢ welfare fund, Philadelphia. [i] incl. 3% vacation stamp fund, St. Louis. [j] 6-hr day, San Francisco. [k] 7-hr day, San Francisco.

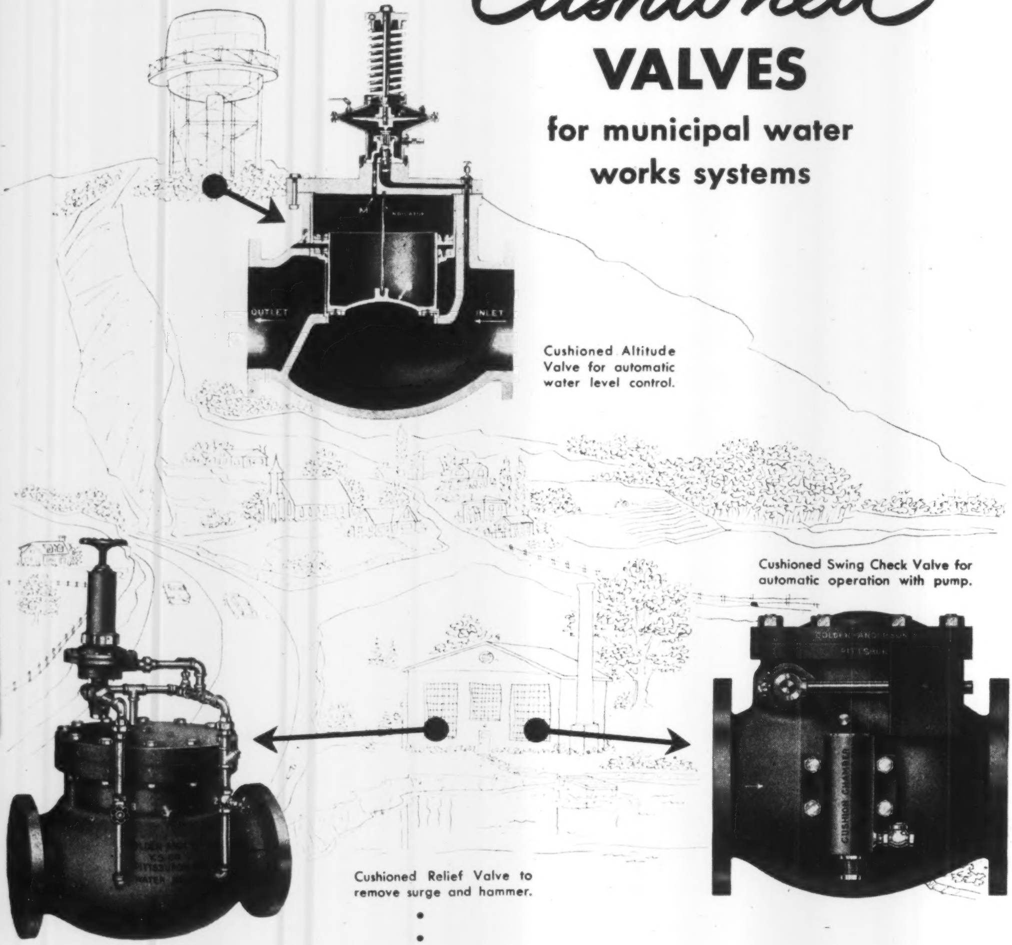
## Prevent Hammer or Shock

# Specify **Golden-Anderson**

# *"Cushioned"*

# **VALVES**

**for municipal water works systems**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*Write*

**for new engineering bulletins designed for you**

**Golden Anderson** *Valve Specialty Company*

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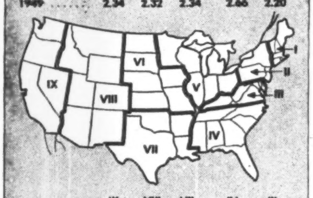
## Journeymen

| Year | U.S. | VI Middle West | V Great Lakes | II Middle Atlantic | I New England |
|---|---|---|---|---|---|
| 1950 ...... | $2.45 | $2.38 | $2.46 | $2.80 | $2.30 |
| 1949 ...... | 2.34 | 2.32 | 2.34 | 2.66 | 2.20 |

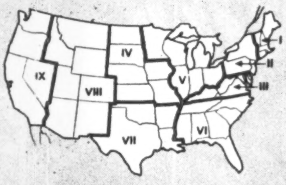


| Year | IX Pacific | VIII Mountain | VII Southwest | IV Southeast | III Border States |
|---|---|---|---|---|---|
| 1950 ...... | $2.31 | $2.28 | $2.22 | $2.08 | $2.39 |
| 1949 ...... | 2.24 | 2.15 | 2.12 | 2.03 | 2.29 |

ENR Business News

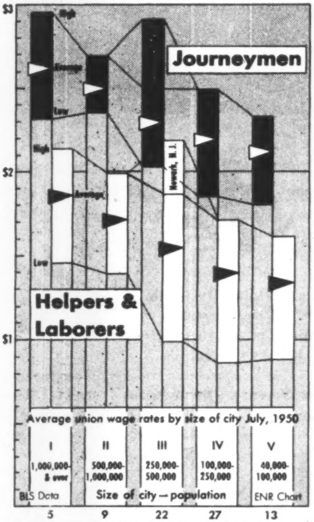
## Helpers & Laborers

| Year ...... | U.S. | VI Middle, West | V Great Lakes | II Middle Atlantic | I New England |
|---|---|---|---|---|---|
| 1950 ...... | $1.65 | $1.66 | $1.75 | $1.87 | $1.65 |
| 1949 ...... | 1.55 | 1.56 | 1.65 | 1.72 | 1.56 |



| Year | IX Pacific | VIII Mountain | VII Southwest | IV Southeast | III Border States |
|---|---|---|---|---|---|
| 1950 ...... | $1.68 | $1.58 | $1.19 | $1.01 | $1.42 |
| 1949 ...... | 1.64 | 1.49 | 1.13 | 1.00 | 1.35 |

ENR Business News



## Average union wage rates in building trades, by region, July 1, 1950

| Trade | United States | I New England | II Middle Atlantic | III Border States | IV Southeast | V Great Lakes | VI Middle West | VII Southwest | VIII Mountain | IX Pacific |
|---|---|---|---|---|---|---|---|---|---|---|
| **All building trades** .......... | $2.29 | $2.15 | $2.58 | $2.16 | $1.87 | $2.34 | $2.23 | $2.01 | $2.01 | $2.2[1] |
| **Journeymen** .............. | $2.45 | $2.30 | $2.80 | $2.39 | $2.08 | $2.46 | $2.38 | $2.22 | $2.28 | $2.31 |
| Asbestos workers ............ | 2.48 | 2.41 | 2.79 | 2.34 | 2.27 | 2.46 | 2.44 | 2.37 | 2.29 | 2.39 |
| Boilermakers ............... | 2.50 | 2.45 | 2.85 | 2.37 | 2.35 | 2.47 | 2.36 | 2.25 | 2.41 | 2.43 |
| Bricklayers ................ | 2.83 | 2.64 | 3.15 | 2.88 | 2.50 | 2.63 | 2.83 | 2.82 | 2.87 | 2.87 |
| Carpenters ................. | 2.37 | 2.14 | 2.81 | 2.30 | 1.91 | 2.46 | 2.31 | 2.07 | 2.20 | 2.18 |
| Cement finishers ........... | 2.37 | 2.59 | 2.77 | 2.23 | 2.01 | 2.35 | 2.35 | 2.11 | 2.20 | 2.22 |
| Electricians (inside) .......... | 2.54 | 2.43 | 2.89 | 2.43 | 2.32 | 2.51 | 2.46 | 2.41 | 2.37 | 2.48 |
| Elevator constructors ......... | 2.56 | 2.47 | 2.83 | 2.63 | 2.35 | 2.52 | 2.43 | 2.44 | 2.41 | 2.54 |
| Glaziers ................... | 2.26 | 2.17 | 2.57 | 2.12 | 1.87 | 2.32 | 2.27 | 1.88 | 1.95 | 2.10 |
| Lathers .................... | 2.78 | 2.77 | 2.85 | 2.73 | 2.33 | 2.57 | 2.52 | 2.76 | 2.74 | 3.03 |
| Machinists ................. | 2.43 | 2.25 | 2.57 | 2.35 | 2.25 | 2.45 | 2.41 | 2.35 | 2.10 | 2.45 |
| Marble setters .............. | 2.55 | 2.40 | 2.67 | 2.65 | 2.38 | 2.48 | 2.46 | 2.43 | 2.50 | 2.53 |
| Mosaic and terz wkrs ........ | 2.58 | 2.34 | 2.90 | 2.53 | 2.40 | 2.45 | 2.48 | 2.29 | 2.69 | 2.32 |
| Painters ................... | 2.26 | 1.98 | 2.40 | 2.05 | 1.89 | 2.33 | 2.17 | 2.00 | 2.08 | 2.32 |
| Paperhangers ............... | 2.23 | 1.77 | 2.19 | 1.90 | 1.99 | 2.34 | 2.08 | 1.92 | 2.12 | 2.31 |
| Plasterers ................. | 2.80 | 2.70 | 3.09 | 2.75 | 2.33 | 2.58 | 2.70 | 2.67 | 2.94 | 2.98 |
| Plumbers ................... | 2.57 | 2.39 | 2.92 | 2.40 | 2.41 | 2.48 | 2.48 | 2.36 | 2.39 | 2.49 |
| Rodmen ..................... | 2.36 | 2.52 | 2.72 | 2.31 | 2.04 | 2.44 | 2.39 | 2.06 | 2.15 | 2.21 |
| Roofers, compo. ............ | 2.28 | 2.29 | 2.63 | 1.95 | 1.78 | 2.35 | 2.23 | 1.87 | 2.11 | 2.24 |
| Roofers, sl & tile ........... | 2.28 | 2.39 | 2.75 | 2.31 | 1.90 | 2.40 | 2.13 | 1.93 | 2.13 | 2.24 |
| Sheet-metal workers ......... | 2.42 | 2.39 | 2.79 | 2.33 | 1.99 | 2.42 | 2.49 | 2.31 | 2.16 | 2.27 |
| Steam & sprklr ftrs .......... | 2.56 | 2.40 | 2.90 | 2.40 | 2.35 | 2.50 | 2.53 | 2.37 | 2.35 | 2.47 |
| Stonemasons ................ | 2.84 | 2.67 | 2.99 | 2.97 | 2.51 | 2.65 | 2.71 | 2.86 | 2.83 | 2.84 |
| Structural-iron wkrs ......... | 2.53 | 2.55 | 2.86 | 2.59 | 2.19 | 2.52 | 2.34 | 2.24 | 2.20 | 2.39 |
| Tile layers ................. | 2.55 | 2.41 | 2.72 | 2.53 | 2.36 | 2.48 | 2.43 | 2.35 | 2.63 | 2.56 |
| **Helpers and laborers** ........ | 1.65 | 1.65 | 1.87 | 1.42 | 1.01 | 1.75 | 1.66 | 1.19 | 1.58 | 1.68 |
| Bricklayers' tenders ......... | 1.85 | 1.65 | 2.06 | 1.48 | 1.07 | 1.80 | 1.70 | 1.34 | 1.81 | 2.03 |
| Building laborers ........... | 1.55 | 1.64 | 1.73 | 1.37 | .97 | 1.69 | 1.61 | 1.11 | 1.49 | 1.60 |
| Comp. roofers' helpers ....... | 1.35 | ...... | 1.50 | 1.55 | .92 | 1.50 | ...... | 1.10 | ...... | ...... |
| Elevator constr. helpers ...... | 1.81 | 1.73 | 2.02 | 1.86 | 1.64 | 1.76 | 1.72 | 1.70 | 1.70 | 1.76 |
| Marble setters' helpers ....... | 1.72 | 1.77 | 1.84 | 1.81 | 1.04 | 1.87 | 1.64 | 1.34 | 1.68 | 1.88 |
| Plasterers' laborers .......... | 1.85 | 1.76 | 2.05 | 1.68 | 1.12 | 1.96 | 1.83 | 1.43 | 1.83 | 2.26 |
| Plumbers' laborers .......... | 1.73 | ...... | 1.81 | 1.47 | 1.12 | 1.82 | 1.79 | 1.16 | 1.66 | 1.74 |
| Terrazzo workers' helpers .... | 1.97 | 1.80 | 2.24 | 1.76 | 1.10 | 1.96 | 1.79 | 1.23 | 1.70 | 1.86 |
| Tile layers' helpers .......... | 1.88 | 1.78 | 2.06 | 1.87 | 1.01 | 1.84 | 1.66 | 1.29 | 1.71 | 1.91 |

## Union labor trends reported by US Bu of Labor Statistics

| Year | All Building Trades | Journeymen | Helpers & Laborers | Bricklayers | Carpenters | Cement Finishers | Electricians (Inside Wiring) | Glaziers | Lathers | Painters | Plasterers | Plumbers & Gas Fitters | Sheet Metal Workers | Steam & Sprinkler Fitters | Stonemasons | Structural Ironworkers | Building Laborers | Bricklayers' Tenders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wage rates per hour—Index, 1939=100** | | | | | | | | | | | | | | | | | | |
| 1907... | 29.3 | 29.7 | 27.3 | 37.7 | 29.8 | 34.5 | 27.9 | ..... | ..... | 26.2 | 37.3 | 33.3 | 30.6 | 30.1 | 33.9 | 27.9 | 30.8 | 30.3 |
| 1913... | 36.1 | 36.9 | 31.8 | 41.5 | 36.8 | 38.0 | 33.8 | ..... | 34.6 | 35.5 | 39.3 | 37.9 | 35.6 | 35.0 | 36.7 | 37.3 | 34.2 | 31.8 |
| 1926... | 88.3 | 88.7 | 84.9 | 94.1 | 88.5 | 86.6 | 81.5 | 80.7 | 83.0 | 90.9 | 92.4 | 83.9 | 86.3 | 84.9 | 92.7 | 81.1 | 86.9 | 85.5 |
| 1930... | 97.0 | 97.5 | 93.3 | 101.8 | 96.9 | 95.4 | 90.9 | 92.6 | 89.6 | 100.6 | 98.1 | 91.5 | 94.7 | 93.5 | 99.1 | 92.5 | 92.9 | 94.9 |
| 1932... | 83.1 | 83.6 | 79.2 | 87.0 | 79.6 | 83.6 | 87.9 | 78.0 | 80.0 | 85.3 | 81.4 | 80.5 | 83.4 | 81.0 | 88.4 | 81.0 | 78.7 | 78.4 |
| 1938... | 99.3 | 99.3 | 99.2 | 99.5 | 99.8 | 99.6 | 99.5 | 99.3 | 96.8 | 99.2 | 99.2 | 99.1 | 98.6 | 99.3 | 99.7 | 98.9 | 99.4 | 99.7 |
| 1942... | 111.9 | 110.9 | 117.5 | 108.3 | 112.1 | 110.8 | 113.5 | 108.8 | 109.1 | 110.5 | 105.0 | 110.5 | 116.0 | 109.3 | 108.0 | 108.7 | 119.6 | 115.7 |
| 1946... | 129.3 | 126.8 | 146.3 | 125.6 | 129.7 | 128.2 | 124.9 | 123.4 | 124.2 | 127.3 | 119.0 | 123.2 | 133.0 | 124.6 | 126.5 | 121.4 | 152.2 | 141.7 |
| 1947... | 147.9 | 144.6 | 171.1 | 145.2 | 149.6 | 144.3 | 140.9 | 141.9 | 144.4 | 142.4 | 139.3 | 142.9 | 146.8 | 139.1 | 145.0 | 136.3 | 177.9 | 165.6 |
| 1948... | 163.5 | 159.4 | 192.7 | 165.6 | 164.7 | 161.1 | 154.4 | 155.5 | 157.8 | 154.4 | 148.2 | 158.2 | 164.4 | 154.3 | 166.0 | 151.9 | 200.8 | 185.5 |
| 1949... | 170.3 | 166.1 | 199.8 | 174.0 | 169.1 | 165.8 | 168.1 | 160.5 | 164.2 | 162.1 | 161.9 | 162.8 | 169.6 | 161.3 | 175.7 | 157.4 | 208.4 | 190.4 |
| 1950... | 177.8 | 173.2 | 210.8 | 180.4 | 177.4 | 172.7 | 172.3 | 169.4 | 179.6 | 167.7 | 169.3 | 166.7 | 177.9 | 168.3 | 187.1 | 164.8 | 220.0 | 203.4 |
| **Hours worked per week—Index, 1939=100** | | | | | | | | | | | | | | | | | | |
| 1907... | 124.3 | 123.8 | 126.1 | 122.9 | 121.0 | 122.7 | 124.2 | ..... | ..... | 133.1 | 125.8 | 120.6 | 117.0 | 120.3 | 118.4 | 121.3 | 121.6 | 118.9 |
| 1913... | 118.2 | 118.0 | 118.3 | 114.9 | 115.6 | 119.8 | 120.7 | ..... | 121.8 | 125.9 | 124.3 | 119.2 | 114.9 | 118.0 | 115.7 | 114.1 | 118.3 | 116.0 |
| 1926... | 114.9 | 115.1 | 113.9 | 113.3 | 113.5 | 113.4 | 115.9 | 117.5 | 118.9 | 120.7 | 118.2 | 116.5 | 111.8 | 114.4 | 114.5 | 112.8 | 112.1 | 113.9 |
| 1930... | 109.8 | 110.0 | 109.0 | 107.1 | 109.4 | 108.1 | 109.9 | 112.4 | 110.4 | 115.4 | 113.0 | 109.9 | 106.9 | 108.5 | 107.1 | 108.8 | 110.0 | 106.9 |
| 1932... | 106.5 | 106.6 | 105.7 | 103.1 | 105.0 | 105.6 | 106.2 | 107.9 | 109.3 | 114.2 | 110.1 | 108.0 | 103.6 | 106.4 | 104.8 | 104.8 | 104.9 | 104.0 |
| 1938... | 100.2 | 100.1 | 100.2 | 99.0 | 100.0 | 100.0 | 100.3 | 100.2 | 100.8 | 110.4 | 100.0 | 99.7 | 100.0 | 99.6 | 100.1 | 100.1 | 100.1 | 100.3 |
| 1942... | 101.1 | 101.8 | 98.8 | 100.8 | 100.8 | 100.6 | 104.6 | 102.0 | 102.5 | 106.5 | 102.0 | 99.9 | 100.9 | 102.2 | 100.2 | 101.1 | 98.8 | 98.6 |
| 1946... | 100.2 | 101.1 | 97.4 | 100.3 | 100.3 | 100.4 | 100.5 | 102.0 | 102.2 | 106.1 | 104.1 | 98.3 | 100.8 | 101.3 | 100.0 | 101.1 | 97.2 | 96.9 |
| 1947... | 100.1 | 100.9 | 97.4 | 99.8 | 100.2 | 100.0 | 100.5 | 103.5 | 102.2 | 106.2 | 103.0 | 97.3 | 100.1 | 101.3 | 99.3 | 101.1 | 97.2 | 96.4 |
| 1948... | 100.1 | 101.0 | 97.3 | 100.5 | 100.2 | 100.0 | 100.5 | 103.5 | 98.1 | 106.2 | 102.9 | 97.6 | 100.1 | 101.3 | 101.0 | 101.1 | 97.2 | 96.4 |
| 1949... | 100.2 | 101.1 | 97.3 | 100.1 | 100.2 | 100.0 | 107.2 | 103.5 | 98.1 | 106.2 | 103.5 | 97.6 | 99.9 | 101.3 | 100.8 | 101.1 | 97.2 | 96.4 |
| 1950... | 100.3 | 101.2 | 97.3 | 100.1 | 100.2 | 100.0 | 102.2 | 103.5 | 101.2 | 106.2 | 105.9 | 98.3 | 99.9 | 101.3 | 100.8 | 101.1 | 97.2 | 96.4 |

## Average wage increase in 85 cities—July to January

U. S. Dept. of Labor, Bu. of Labor Statistics.

| | Per cent | | | | cents per hr | | | | Rates, Jan. 3, 1950 | | | Rates, Jan. 2, 1951 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3Q | | 4Q | | 3Q | | 4Q | | | | | | | |
| Trade | '49 | '50 | '49 | '50 | '49 | '50 | '49 | '50 | Low | Aver | High | Low | Aver | High |
| Bricklayers .......... | 0.4 | 1.1 | 0.3 | 1.1 | 1.2 | 3.1 | 0.7 | 3.1 | $2.13 | $2.76 | $3.25 | $2.25 | $2.89 | $3.50 |
| Carpenters .......... | 1.2 | 1.4 | ... | 2.2 | 2.8 | 3.3 | .1 | 5.2 | 1.63 | 2.28 | 3.00 | 1.65 | 2.46 | 3.00 |
| Electricians ......... | .6 | 2.1 | .4 | 2.4 | 1.6 | 5.4 | 1.0 | 6.2 | 1.83 | 2.51 | 3.00 | 1.90 | 2.66 | 3.20 |
| Painters ............ | .4 | 1.9 | .2 | .9 | .9 | 4.2 | .5 | 2.1 | 1.38 | 2.20 | 2.50 | 1.38 | 2.33 | 2.65 |
| Plasterers ........... | .3 | 1.6 | .2 | 1.1 | .8 | 4.4 | .5 | 3.2 | 2.00 | 2.68 | 3.25 | 2.25 | 2.88 | 3.30 |
| Plumbers ............ | .5 | 2.3 | .4 | .8 | 1.2 | 5.8 | 1.1 | 2.0 | 1.90 | 2.54 | 3.00 | 2.00 | 2.65 | 3.10 |
| Bldg laborers ........ | 1.5 | 1.3 | .2 | 2.4 | 2.2 | 2.0 | .3 | 3.7 | .75 | 1.49 | 2.13 | .85 | 1.61 | 2.19 |

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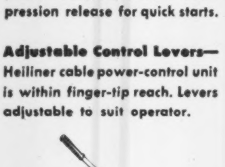

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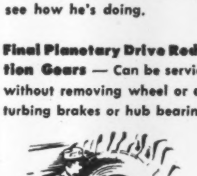

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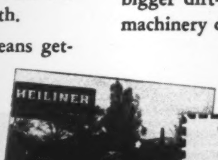

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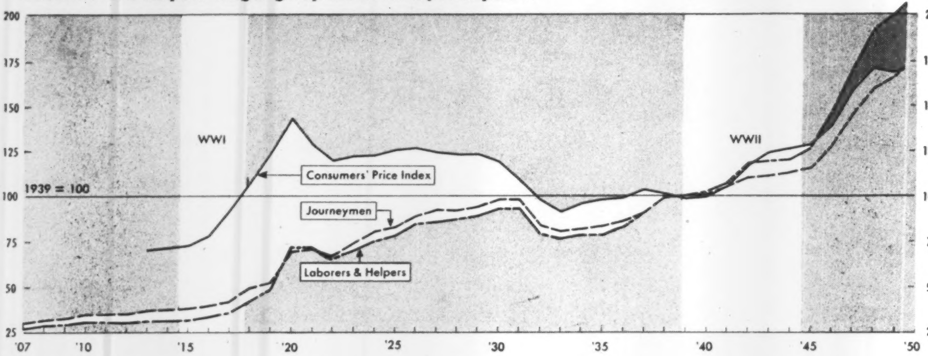
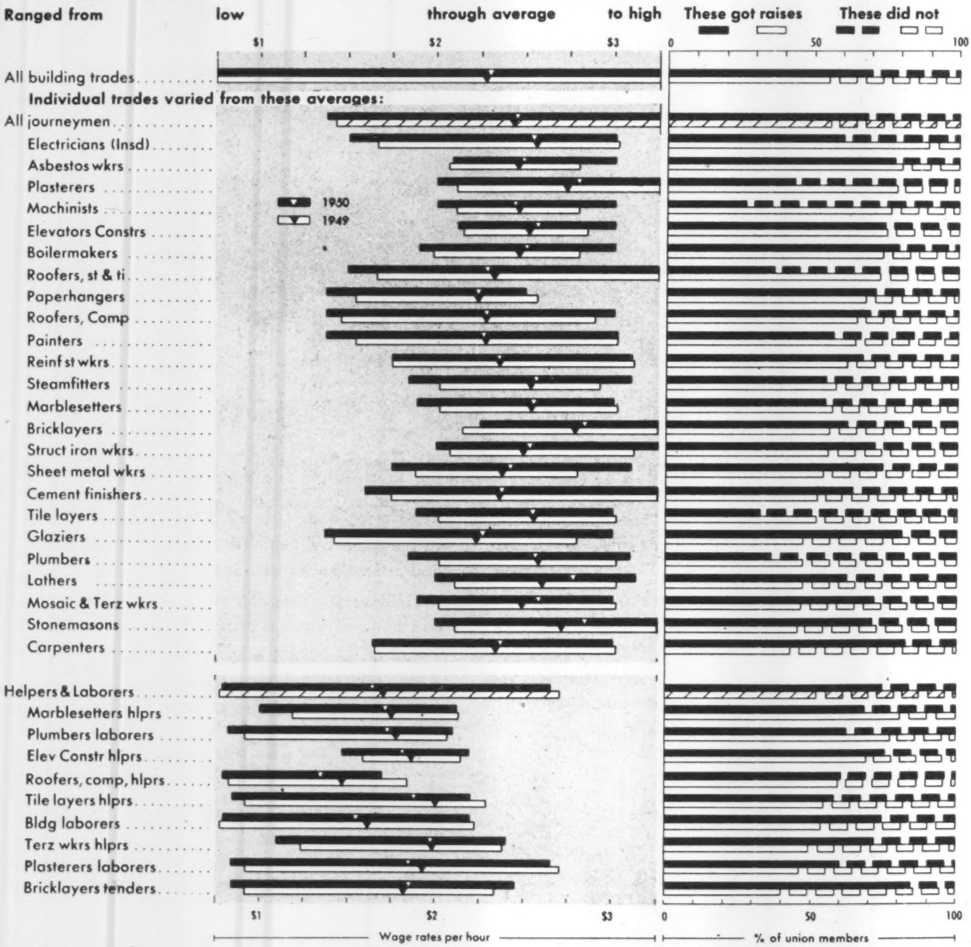
# Union wage rates in the building trades on July 1, 1950 ···

**Laborers' and helpers' wages go up faster than journeymen's**



**Union wages increased more than in 1949 and more workers shared in increase**

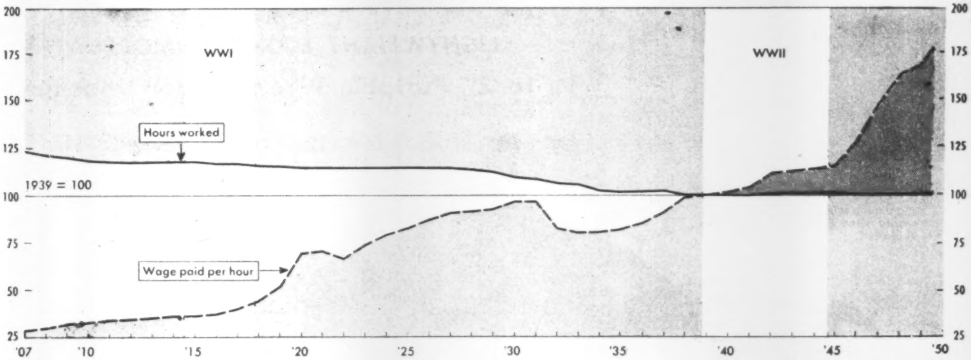


Data: BIS Wage Analysis Branch

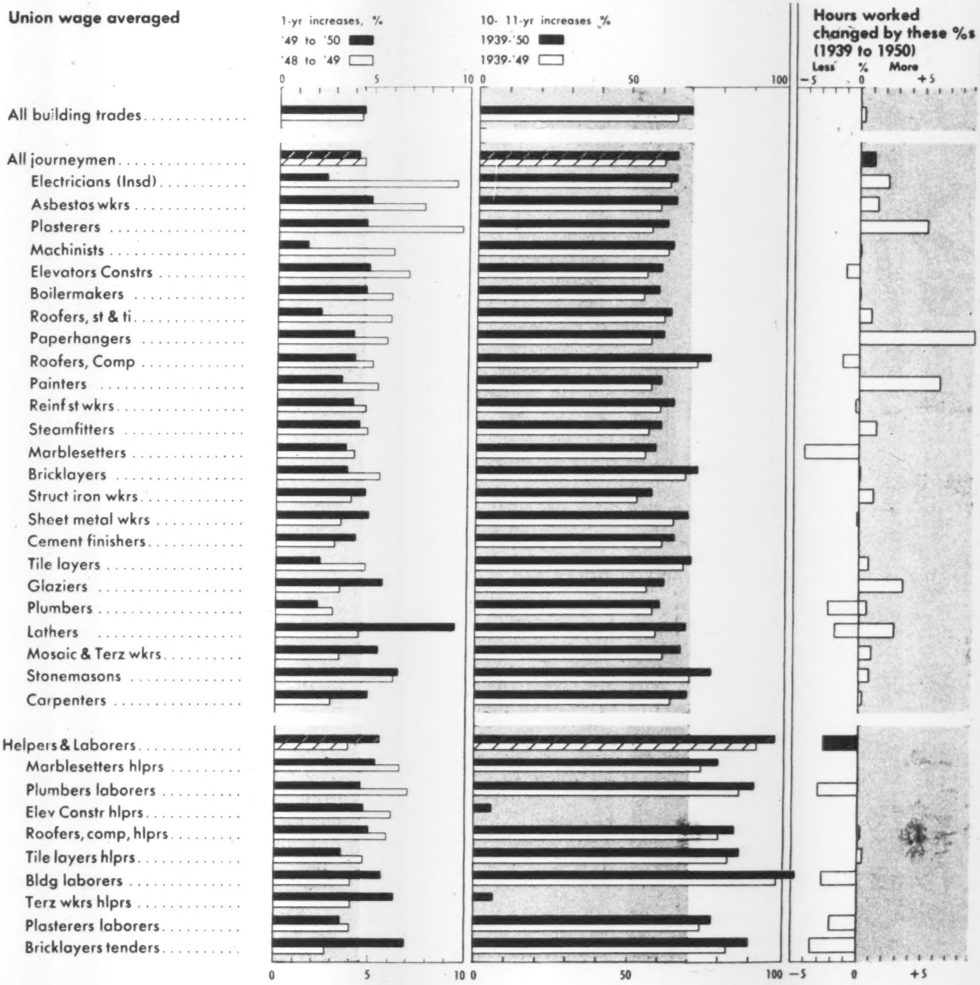
Chart: ENR Business News

# ··· reported by U. S. Bureau of Labor Statistics

**Hours worked by all building trades decline as wages climb**



**Union wage averaged**



# *New!* BEAVER MODEL "E"

## *LIGHTWEIGHT ECONOMY MODEL*

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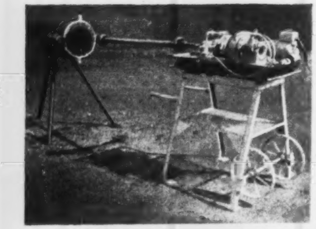
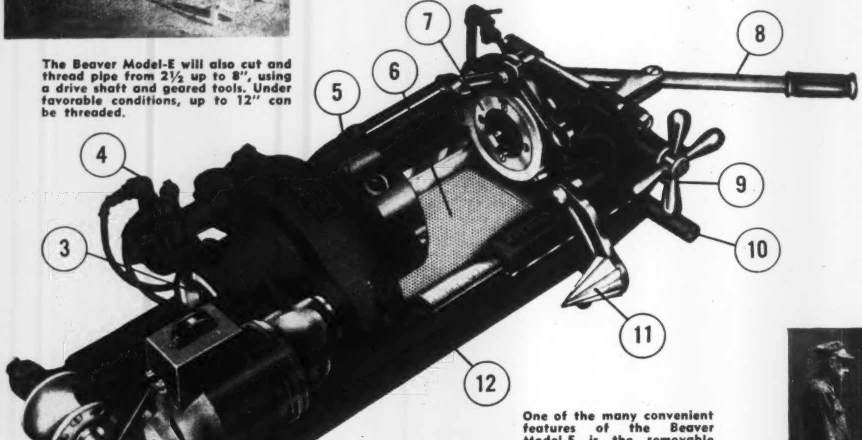
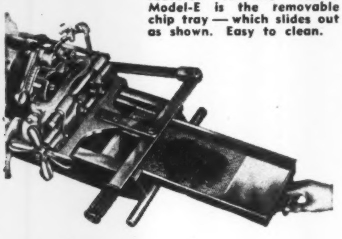


**The Beaver Model-E will also cut and thread pipe from 2½ up to 8", using a drive shaft and geared tools. Under favorable conditions, up to 12" can be threaded.**



**One of the many convenient features of the Beaver Model-E is the removable chip tray — which slides out as shown. Easy to clean.**



**With a portable stand and 14" retractable wheels, the Beaver Model-E (185 lbs.) is easily moved by one man.**

## *Check These Features*

GEARS RUN IN OIL. **Gears run in an enclosed oil sump. Longer gear life—more power—less noise.**

A CHUCK THAT REALLY HOLDS. **A standard, full-size, wrench-operated scroll chuck prevents costly losses of labor and material caused by "chuck slippage"—especially on galvanized, stainless steel or hard copper pipe.**

RIGHT HAND OPERATION. **The Beaver Model-E is built like a lathe, for right-hand operation. Chuck to left; tool mounting to right.**

1. MOTOR. **High-speed geared motor. Choice, 110/115 or 220/230 volt. Universal, operates on AC or DC, 25 to 60-cycle. Reversible at switch. Motor develops 1.6 horsepower. Heavy-duty, weather-proof motor—accessibly located for greatest convenience, safety and adequate ventilation, insuring cooler operation, longer brush and armature service.**
2. OUTBOARD PIPE SUPPORT. **Patented. Outboard eccentric-spool pipe-centering support, separate from the spindle, eliminates spindle "whip" caused by long revolving lengths of pipe, reduces bearing wear, prevents flat-sided threads (which leak) caused by spindle whip.**
3. BRONZE BEARINGS. **Renewable.**
4. OIL PUMP. **Reversible. Automatic. Conveniently located.**
5. SAFETY CHUCK WRENCH EJECTOR. **Prevents injury to operator and damage to machine if wrench is inadvertently left in machine.**
6. CHIP TRAY. **Removable. Perforated to permit quick circulation of oil.**
7. DIE HEADS. **Quick-opening, adjustable, of the "ring-type" no hinge to get fouled with fine turnings. There are 195 different kinds and sizes of dies in stock, always at your service.**
8. LEVER ACTION. **Carriage is moved forward and backward by a smooth-working lever action.**
9. CUTOFF. **Standard equipment on the Model-E is the patented ball-bearing, self-centering wheel-and-roller cutoff, which cuts ⅛ to 2" pipe and ¼ to ⅞" bolts or solid rods. Interchangeable knife cutoff also available for cutting, grooving or beveling pipe.**
10. CARRYING HANDLES. **Note convenient hand-holds for easy carrying.**
11. REAMER. **Drop-forged ⅛ to 2" reamer swings in and out of position.**
12. STEEL WELDMENT BASE. **Built like an automobile frame. Welded base.**
13. WEIGHT, **as carried, about 185 lbs. Base size 27 x 12½ inches.**

**BEAVER**
**PIPE TOOLS**
**276-300 Dana Avenue • Warren, Ohio, U.S.A.**

# Building trades wage rates—February 1, 1951

## Quoted in $/hr., 8-hr. day; time and one-half for overtime after 40 hr. except where noted.

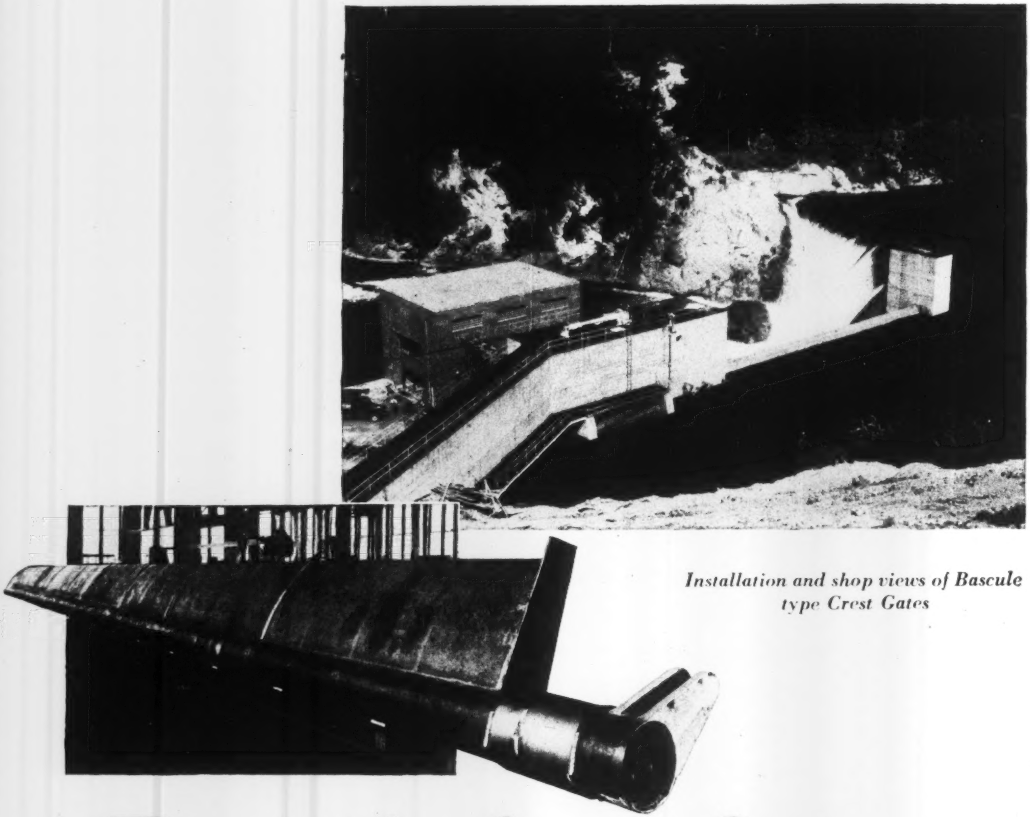
| Compiled by ENR<br>City and State | Carp-enters | Brick-layers | Struct. Irwkrs. | Reinf. Irwkrs. | Labor Bldg. | Labor, Hvy Cnstr. | Stone-masons | Mason's Helpers | Plasterers | Mosaic & Terrazzo | Tile Layers | Cement Finishers | Lathers | Electrns. (Inside) | Painters | Glaziers | Plumbers | Steam-fitters | Roofers | Water-proofers | Sht. Met. Workers | Welders | Hoist Eng. 1-Drum | Hoist Eng. 2-Drum | Tract. Op. (30-hp+) | Shovel Operator | Truck Dr. (1½ T+) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atlanta, Ga. [e] | $2.00 | $2.50 | $2.25 | $2.25 | $1.05 | $1.05 | 2.50 | $1.05 | $2.50 | $2.50 | $2.50 | $2.20 | $2.50 | $2.50 | [29]$2.00 | $2.00 | $2.60 | $2.35 | $1.50 | $1.50 | $2.00 | $2.25 | $1.75 | $2.00 | $1.75 | $1.75 | $1.25 |
| Austin, Tex. | 2.13 | 3.00 | 2.38 | 2.13 | .75 | .75 | 3.00 | 1.00 | 3.00 | 2.50 | 2.50 | 2.25 | 3.00 | 2.38 | [30]1.88 | ..... | 2.38 | 2.38 | [H]2.00 | ..... | 2.50 | 2.00 | 1.88 | 2.13 | [O]1.88 | 2.13 | 1.00 |
| Baltimore, Md. [p] | 2.35 | 3.00 | 2.65 | 2.35 | 1.35 | 1.35 | 3.00 | 1.45 | 2.50 | 2.50 | 2.50 | 2.30 | 2.50 | [78]2.75 | [79]2.05 | 2.15 | 2.50 | 2.50 | [44]2.00 | 2.25 | 2.50 | * | [AA]2.80 | [AA]2.80 | [44]1.95 | [AA]2.80 | 1.40 |
| Billings, Mont. [f] | 2.13 | 3.00 | §2.25 | §2.25 | §1.46 | §1.50 | 3.00 | 1.88 | 2.75 | 3.00 | 3.00 | §2.25 | N.A. | §2.13 | 2.00 | 2.00 | 2.50 | 2.50 | 1.85 | 1.85 | 2.38 | * | §1.93 | §2.13 | §2.13 | §2.28 | §1.65 |
| Birmingham, Ala. | 2.13 | 2.75 | 2.35 | 2.10 | 1.10 | 1.20 | 2.75 | 1.10 | 2.30 | 2.50 | 2.50 | 2.18 | 2.35 | 2.50 | 2.25 | 2.00 | 2.50 | 2.50 | 1.70 | 1.70 | 2.13 | 2.35 | [16]2.35 | [16]2.35 | 1.98 | 2.23 | 1.30 |
| Bismarck, N. D. | 1.75 | 2.50 | 2.35 | 2.35 | 1.25 | 1.25 | 2.50 | 1.35 | 2.50 | ..... | 2.50 | 2.25 | 1.75 | 2.25 | 1.70 | 1.70 | 2.25 | 2.25 | 1.75 | 1.75 | 1.90 | * | 2.00 | 2.15 | 2.00 | 2.20 | 1.35 |
| Boise, Idaho [g] | 2.00 | 2.50 | 2.23 | [10]2.00 | 1.53 | 1.50 | 2.50 | 1.88 | 2.50 | 2.50 | 2.50 | 2.13 | 2.38 | 2.25 | [31]1.95 | 2.00 | 2.25 | 2.25 | 1.88 | 1.88 | 2.00 | [Q]2.54 | 1.80 | 1.90 | [P]2.10 | [S]2.40 | ..... |
| Boston, Mass. [q] | 2.38 | 2.78 | [g]2.70 | [g]2.70 | 1.75 | 1.75 | 2.78 | ..... | 2.85 | 2.53 | 2.53 | 2.78 | 2.85 | [37]2.80 | 2.25 | 2.23 | [42]2.45 | 2.60 | [p]2.30 | 2.30 | [p]2.45 | ..... | ‡112 | ‡112 | ‡97 | ‡112 | 1.55 |
| Buffalo, N. Y. [a][1] | 2.40 | 2.75 | 2.53 | 2.53 | 1.78 | 1.78 | 2.75 | ..... | ..... | 2.35 | 2.35 | 2.36 | 2.65 | 2.65 | 2.25 | [39] | 2.65 | 2.65 | 2.28 | 2.28 | 2.38 | [39] | 2.53 | 2.53 | 2.03 | ‡101 | 1.68 |
| Burlington, Vt. | 1.75 | 2.75 | ..... | ..... | [B]1.00 | [D]1.15 | 2.75 | [E]1.25 | 2.75 | 2.75 | 2.75 | 2.75 | ..... | 1.75 | 1.50 | ..... | 1.75 | 1.75 | [M]1.90 | ..... | 1.93 | 1.60 | 1.50 | 1.65 | 1.65 | 1.65 | 1.10 |
| Charleston, S. C. | 1.50 | 2.25 | 2.00 | 1.75 | .75 | .75 | 2.25 | 1.00 | 2.00 | 2.00 | 2.00 | 1.75 | 1.75 | 2.00 | 1.50 | 1.50 | 2.25 | 2.25 | 1.75 | 1.50 | 1.75 | 2.00 | 1.00 | 1.50 | 1.50 | 2.00 | 1.50 |
| Charleston, W. Va. [r] | 2.25 | [BB]2.75 | 2.50 | 2.50 | 1.40 | 1.40 | 2.75 | 1.55 | [12]2.25 | 2.75 | 2.75 | [R]2.10 | [U]2.13 | 2.43 | 2.25 | [40] | 2.50 | 2.50 | 2.00 | 2.00 | 2.15 | ..... | 2.50 | 2.50 | 2.05 | 2.50 | 1.50 |
| Charlotte, N. C. | 1.50 | 2.25 | 2.13 | 1.88 | .90 | .90 | 2.25 | 1.50 | 2.25 | 2.25 | 2.00 | 1.50 | 2.25 | 1.65 | 1.50 | 1.50 | 2.25 | 2.25 | 1.50 | 1.50 | 1.50 | 2.00 | 1.00 | 1.75 | 1.25 | 1.75 | .85 |
| Chicago, Ill. [s] | 2.55 | [c]2.55 | 2.60 | 2.60 | [A]1.85 | [A]1.85 | 2.55 | 1.85 | 2.75 | 2.55 | 2.50 | 2.45 | 2.75 | 2.65 | 2.48 | 2.65 | 2.60 | 2.60 | 2.55 | 2.55 | 2.60 | 2.60 | 2.50 | 2.50 | 2.25 | 2.80 | 1.75 |
| Cincinnati, Ohio [t] | 2.28 | 2.70 | 2.45 | [11]2.30 | 1.65 | 1.65 | 2.70 | 1.85 | 2.50 | 2.45 | 2.45 | 2.18 | 2.45 | 2.55 | 2.20 | 2.50 | 2.55 | 2.55 | [45]2.05 | ..... | 2.35 | 2.55 | 2.45 | 2.45 | 2.20 | 2.45 | [K]1.80 |
| Cleveland, Ohio | 2.83 | §2.70 | 2.83 | 2.83 | 2.10 | [G]2.63 | §2.70 | 2.10 | 2.83 | 2.28 | 2.65 | 2.65 | 2.83 | 2.83 | 2.53 | 2.65 | 2.83 | 2.83 | [46]2.58 | 2.58 | 2.65 | 2.83 | 2.58 | 2.83 | 1.60 | 2.83 | 1.52 |
| Columbus, Ohio[2] | 2.25 | 2.75 | 2.45 | 2.45 | 1.50 | 1.42 | 2.75 | 1.70 | 2.63 | 2.15 | 2.15 | 2.63 | 2.48 | 2.45 | 2.08 | 1.95 | 2.45 | 2.45 | 2.25 | 2.43 | 2.25 | 2.45 | 2.20 | 2.20 | 2.20 | 2.45 | 1.50 |
| Concord, N. H. | [4]1.85 | 3.13 | 2.50 | 2.70 | 1.40 | 1.40 | 3.13 | 2.00 | 3.13 | 2.75 | 2.75 | 3.13 | 1.85 | 2.00 | 1.65 | ..... | 2.10 | 2.10 | 1.85 | ..... | 2.10 | 2.10 | 2.18 | 2.18 | 1.83 | 2.28 | 1.45 |
| Dallas, Tex. [b] | 2.25 | 3.13 | 2.50 | 2.25 | 1.08 | [F]1.50 | 3.13 | 1.35 | 3.13 | 2.50 | 2.50 | 2.36 | 3.13 | 2.50 | 2.13 | 1.88 | 2.50 | 2.50 | 1.88 | 1.88 | 2.50 | 2.50 | 2.13 | 2.38 | 2.38 | 2.38 | [69]1.35 |
| Dayton, Ohio [u] | 2.38 | 2.75 | 2.53 | 2.38 | 1.63 | 1.52 | 2.75 | 1.88 | 2.53 | 2.50 | 2.50 | 2.21 | 2.53 | 2.73 | 2.25 | 2.08 | 2.45 | 2.45 | 2.38 | 2.18 | 2.38 | 2.53 | 2.38 | 2.38 | 2.38 | 2.63 | 1.68 |
| Denver, Colo. [h] | 2.35 | 3.00 | 2.20 | 2.20 | 1.50 | 1.50 | 3.00 | 1.85 | 3.00 | 2.60 | 2.60 | 2.40 | 3.00 | 2.50 | 2.13 | 2.10 | 2.40 | 2.40 | 2.35 | 2.35 | 2.25 | 2.35 | 2.25 | 2.40 | 2.25 | 2.40 | 1.65 |
| Des Moines, Ia. [jj] | 2.25 | 2.88 | 2.25 | 2.25 | N.A. | N.A. | 2.88 | N.A. | 2.50 | 2.13 | 2.25 | 2.25 | 2.25 | 2.45 | [33]1.90 | 1.90 | 2.50 | 2.50 | 1.73 | N.A. | 2.25 | * | N.A. | N.A. | 2.10 | 2.25 | 1.65 |
| Detroit, Mich. | 2.60 | 2.85 | 2.80 | 2.48 | 1.90 | 1.90 | 2.85 | 1.90 | 2.85 | 2.63 | 2.50 | 2.40 | 2.85 | 2.85 | 2.25 | 2.15 | 2.70 | 2.70 | 2.63 | 2.98 | 2.63 | ..... | 2.60 | 2.80 | 2.60 | 2.60 | 1.93 |
| Duluth, Minn. | [5]2.00 | [8]2.45 | 2.25 | 2.00 | [13]1.45 | ..... | [17]2.45 | ..... | 2.35 | ..... | [20]2.00 | [22]1.90 | [24]2.30 | 2.30 | 1.90 | [41]1.90 | 2.25 | 2.25 | 2.00 | [23]1.90 | [18]2.15 | * | ..... | ..... | ..... | ..... | 1.52 |
| Fort Worth, Tex. | [6]2.13 | 3.13 | 2.38 | 2.13 | .95 | 1.05 | 2.50 | [C]1.05 | 3.13 | 2.38 | 2.38 | 2.38 | 3.13 | 2.50 | 2.00 | 1.88 | 2.50 | 2.50 | [47]1.88 | 1.88 | 2.50 | 2.38 | 2.13 | 2.38 | 2.00 | 2.25 | 1.10 |
| Harrisburg, Pa. [v] | 2.10 | 2.75 | 2.90 | 2.65 | 1.35 | 1.35 | 2.75 | 1.50 | 2.25 | ..... | 2.75 | 2.20 | 2.33 | 2.40 | 1.70 | 1.90 | 2.35 | 2.35 | 1.65 | 1.90 | 2.10 | * | 2.55 | 2.55 | 2.18 | 2.80 | 1.58 |
| Helena, Mont. | 2.38 | 3.00 | 2.25 | ..... | 1.50 | 1.50 | 2.50 | 1.50 | 3.00 | ..... | ..... | 2.50 | ..... | [e]2.40 | 3.00 | ..... | 2.50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Houston, Tex. [l] | 2.25 | 2.88 | 2.38 | 2.25 | 1.33 | 1.33 | 2.88 | 1.53 | 2.75 | 2.50 | 2.50 | 2.25 | 2.75 | 2.63 | 2.13 | 2.13 | 2.50 | 2.50 | 2.13 | 2.00 | 2.50 | ..... | 2.00 | 2.38 | 2.00 | 2.38 | 1.38 |
| Indianapolis, Ind. [a] | 2.30 | 2.75 | 2.45 | 2.45 | 1.50 | ..... | 2.75 | 1.75 | 2.50 | 2.50 | 2.50 | 2.08 | 2.37 | [38]2.45 | 2.13 | 2.25 | 2.50 | 2.50 | 1.90 | 1.90 | 2.35 | ..... | 2.40 | 2.40 | 2.40 | 2.40 | [67]1.55 |
| Jackson, Miss | 2.05 | [Z]2.75 | 2.40 | 2.15 | [13].95 | [13].95 | [Z]2.75 | [13]1.05 | [18]2.30 | 2.30 | 2.30 | [19]2.30 | [25]2.13 | 2.25 | 2.00 | 1.38 | 2.25 | 2.25 | [49]1.65 | 1.75 | 2.00 | ..... | [56]2.00 | ..... | 2.00 | 2.25 | [68]1.28 |
| Jacksonville, Fla. | 2.00 | 2.65 | 2.15 | 1.80 | [A].90 | 1.00 | ..... | .85 | 2.25 | 2.00 | 2.25 | 1.75 | 2.25 | 2.50 | 1.87 | 1.75 | 2.50 | 2.50 | 1.80 | 2.30 | 1.50 | 2.50 | 2.00 | 2.00 | 1.65 | 2.00 | 1.48 |
| Jamestown, N. Y. [j] | 2.38 | 2.75 | 2.50 | 2.50 | 1.75 | 1.75 | 2.75 | 1.75 | 2.50 | 2.50 | 2.50 | 2.50 | 2.75 | 2.50 | 2.00 | 2.10 | 2.50 | 2.50 | 2.13 | 2.50 | 2.13 | ..... | 2.53 | 2.78 | 2.25 | 2.53 | 1.75 |
| Jefferson City, Mo. [a] | 2.00 | 3.00 | 2.50 | 2.50 | [14]1.25 | 1.25 | ..... | [14]1.25 | 2.50 | ..... | ..... | 2.50 | 2.00 | 2.25 | 2.00 | 2.00 | 2.25 | 2.25 | 2.00 | ..... | 2.00 | 2.25 | 2.55 | 2.55 | 2.55 | 2.55 | 1.50 |
| Kansas City, Mo. [w] | 2.23 | 2.68 | 3.38 | 2.25 | 1.65 | 1.65 | 2.43 | 1.83 | 2.83 | 2.50 | 2.50 | 2.23 | 2.53 | 2.43 | [32]2.15 | 2.32 | 2.63 | 2.63 | 2.05 | 2.05 | 2.50 | * | [57]2.23 | [60]2.45 | 2.23 | 2.23 | 1.73 |
| Los Angeles [k] | 2.35 | 2.75 | 2.50 | 2.38 | 1.75 | 1.75 | 2.75 | 1.83 | 3.13 | 2.40 | 2.50 | 2.38 | 3.13 | 2.63 | †2.38 | [d]2.16 | 2.63 | 2.63 | 2.50 | 2.50 | 2.47 | * | 2.25 | 2.25 | 2.50 | 2.68 | 1.83 |
| Louisville, Ky. [jj] | 2.25 | 2.78 | 2.45 | 2.25 | 1.52 | 1.52 | 2.78 | ..... | 2.63 | 2.25 | 2.25 | 2.25 | 2.35 | 2.50 | 2.05 | 2.15 | 2.50 | 2.50 | 1.90 | ..... | 2.35 | 2.10 | 2.30 | 2.30 | 2.30 | 2.30 | 1.63 |
| Meridian, Miss. | 2.00 | 2.50 | 2.25 | 2.00 | .90 | .90 | 2.50 | 1.00 | 2.25 | 2.75 | 2.75 | 2.00 | [26]1.25 | 3.25 | 2.00 | 2.25 | 3.25 | 2.25 | [50]1.65 | 2.25 | 2.00 | [58]5.00 | [56]2.00 | ..... | 2.00 | 2.25 | [60]1.25 |
| Milwaukee, Wis. | ..... | 2.65 | 2.35 | 2.25 | 1.75 | 1.85 | 2.65 | 1.85 | 2.50 | 2.60 | 2.40 | 2.15 | 2.50 | 2.45 | [39]2.35 | 2.20 | 2.45 | 2.45 | 2.10 | 2.10 | 2.25 | 2.35 | 2.25 | 2.25 | [62]2.20 | 2.55 | 1.70 |
| Minneapolis [ba] | 2.12 | 2.40 | 2.28 | 2.15 | 1.52 | 1.52 | 2.40 | 2.07 | 2.50 | 2.38 | 2.45 | 2.22 | 2.42 | 2.50 | 2.05 | 1.92 | 2.44 | 2.44 | 2.00 | 2.00 | 2.25 | * | 2.07 | 2.07 | [J]2.07 | 2.27 | [I]1.87 |
| Nashville, Tenn. [x] | 2.00 | 2.75 | 2.25 | 2.10 | .93 | 1.00 | 2.75 | 1.08 | 2.63 | 2.50 | 2.50 | 1.90 | 2.38 | 2.40 | [35]1.80 | 1.75 | 2.38 | 2.38 | 2.00 | 2.00 | 2.25 | * | 1.75 | 2.00 | [63]1.63 | 2.15 | 1.20 |
| New Orleans, La. [y] | 1.98 | 2.60 | 2.35 | 2.35 | 1.10 | 1.10 | ..... | 1.20 | 2.28 | ..... | ..... | ..... | 2.28 | 2.40 | 1.80 | 1.88 | 2.35 | 2.35 | 1.83 | ..... | 2.03 | 2.23 | 2.23 | 2.23 | 1.98 | 2.23 | 1.15 |
| New York City [ii] | †[s]3.00 | †[r]3.25 | [e]3.25 | [e]3.00 | [e]1.90 | [e]1.90 | †[s]3.20 | †[m]2.15 | ∦[r]3.30 | †[q]3.00 | [w,74]2.95 | †[e]3.00 | †[e]3.00 | ∦[e]3.20 | †[p]3.00 | †[e]3.00 | †[r,43]3.00 | †[e]3.10 | †[e]3.00 | †[e]3.00 | †[e]3.10 | [p,54]2.75 | [r,64]2.75 | [e,62]3.00 | ..... | [e,65]3.50 | ..... |
| Newark, N. J. | †[e,80]3.00 | †,[e]3.25 | [e,81]3.10 | [e,81]3.10 | †2.19 | ..... | ..... | †2.19 | †,[e]3.25 | ..... | ..... | †,[e]3.25 | †3.00 | [e]3.25 | †[p,82]2.65 | 2.85 | [e]2.88 | [e]2.88 | †2.85 | ..... | †2.75 | ..... | [e]3.25 | [e]3.25 | [e]2.50 | [e]3.25 | 2.85 |
| Oklahoma City [jj] | 2.20 | 3.50 | 2.25 | 2.25 | 1.30 | 1.30 | 2.50 | 1.45 | 3.00 | 2.50 | 2.50 | 2.38 | 3.00 | 2.50 | 2.00 | 1.90 | 2.50 | [e]2.50 | 1.90 | 1.90 | 2.50 | ..... | 1.75 | 2.00 | 1.75 | 2.00 | 1.35 |
| Omaha, Neb. [z] | 2.18 | [Y]2.40 | 2.28 | 2.28 | 1.43 | 1.43 | 2.40 | 1.43 | [Y]2.40 | 2.25 | 2.25 | 2.18 | 2.38 | 2.45 | [35]1.90 | 1.83 | 2.50 | 2.50 | [48]1.73 | 1.73 | 2.15 | 1.50 | 2.00 | 2.28 | 2.28 | 2.28 | 1.43 |
| Philadelphia, Pa. [aa] | 2.65 | [m]3.25 | [f]2.80 | [f]2.40 | 1.48 | 1.78 | 2.88 | 1.48 | [c]3.00 | 2.75 | 2.75 | 2.17 | [c]2.85 | [DD]3.03 | [h,37]2.15 | 2.38 | [c]2.75 | 2.75 | [X]2.38 | [X]2.38 | [c]2.58 | * | [59]2.65 | [59]2.65 | 2.28 | 2.90 | [70]1.60 |
| Phoenix, Ariz. [l] | 2.28 | 3.00 | 2.43 | 2.28 | 1.63 | 1.63 | 3.00 | ..... | 3.00 | 3.00 | 3.00 | 2.28 | 3.00 | 2.45 | 2.20 | ..... | 2.50 | 2.50 | 2.00 | 2.00 | 2.13 | 2.20 | 2.15 | ..... | 2.20 | 2.40 | 1.70 |
| Portland, Ore. [bb] | 2.25 | 3.00 | 2.50 | 2.25 | 1.75 | 1.70 | 3.00 | 2.15 | 2.75 | 2.38 | 2.38 | [28]2.30 | 2.65 | 2.60 | 2.25 | 2.20 | [w]2.50 | [30]2.50 | [50]2.33 | 2.33 | 2.15 | * | 2.10 | 2.40 | 2.30 | 2.45 | 1.75 |
| Providence, R. I. [cc] | 2.25 | 2.78 | 2.60 | 2.60 | 1.50 | 1.60 | 2.78 | 1.60 | 2.85 | 1.90 | 1.90 | 2.50 | 2.85 | 2.25 | 1.95 | 2.23 | 2.40 | 2.40 | 2.20 | 2.20 | 2.40 | 2.25 | 2.63 | 2.63 | 2.05 | 2.63 | 1.50 |
| Richmond, Va. | 1.98 | 2.50 | 2.40 | 2.15 | 1.00 | 1.00 | 2.50 | 1.25 | 2.33 | ..... | ..... | 1.80 | 2.25 | 2.17 | 1.75 | 1.75 | 2.25 | 2.25 | ..... | ..... | 2.00 | 2.25 | 1.88 | 2.15 | 2.00 | 2.15 | 1.20 |
| St. Louis, Mo. [a] | [7]2.50 | [c]3.00 | [7]2.50 | [7]2.50 | [15]1.65 | [15]1.65 | [c]3.00 | 2.20 | 2.88 | 2.75 | 2.63 | [b]2.75 | 2.98 | [j]2.63 | [38]2.75 | 2.75 | 2.63 | [e]2.63 | [50]2.48 | 2.63 | 2.63 | 2.63 | 2.00 | 2.55 | 2.55 | 2.55 | 1.50 |
| St. Paul, Minn. [b,d] | 2.12 | 2.40 | 2.28 | 2.15 | 1.52 | 1.52 | 2.40 | 2.02 | 2.42 | 2.38 | 2.45 | 2.07 | 2.42 | 2.50 | 2.02 | 1.92 | 2.44 | 2.44 | 2.00 | 2.00 | 2.25 | * | 2.07 | 2.07 | [J]2.07 | 2.27 | [I]1.87 |
| Salt Lake City [m] | 2.00 | 2.50 | 2.28 | 2.20 | 1.45 | 1.45 | 2.50 | 1.85 | 2.63 | 2.25 | 2.25 | 2.00 | 2.50 | 2.40 | 2.00 | 1.85 | 2.20 | 2.20 | 2.10 | ..... | 2.00 | * | 1.95 | 2.05 | 2.10 | 2.25 | 2.50 |
| San Antonio [n] | 2.13 | 3.00 | 2.50 | 2.25 | 1.06 | 1.06 | 3.00 | 1.33 | 3.00 | 2.25 | 2.25 | 2.50 | 2.88 | 2.38 | 2.00 | 2.00 | 2.50 | 2.50 | [51]1.50 | * | 2.50 | * | 1.88 | 2.13 | 2.13 | 2.13 | 1.50 |
| San Diego, Calif. [o] | 2.35 | 2.75 | 2.46 | 2.38 | 1.75 | 1.75 | 2.75 | 1.83 | 3.13 | 2.50 | [21]2.50 | 2.38 | 3.13 | 2.63 | †2.38 | [d]2.04 | 2.63 | 2.63 | 2.50 | 2.50 | 2.47 | * | 2.25 | 2.25 | 2.50 | 2.68 | [71]1.83 |
| San Francisco [dd][3] | 2.33 | †3.25 | 2.58 | 2.33 | 1.65 | [16]1.90 | †3.00 | †1.88 | 3.00 | 2.38 | 2.88 | 2.20 | 3.00 | 2.75 | 2.45 | 2.30 | 2.63 | 2.63 | 2.50 | 2.50 | 2.31 | * | 2.19 | 2.19 | [64]2.28 | 2.59 | [72]1.60 |
| Santa Fe, N. Mex. | 2.25 | 4.00 | 2.25 | 2.00 | 1.30 | ..... | 2.50 | ..... | 2.50 | ..... | ..... | 2.10 | 2.25 | 2.25 | 2.00 | 1.75 | 2.50 | 2.50 | 2.00 | ..... | 2.25 | 2.50 | 2.00 | 2.10 | 2.00 | 2.35 | 1.65 |
| Seattle, Wash. [ee] | 2.30 | [CC]3.50 | 2.50 | 2.30 | 1.90 | 1.95 | 3.00 | 2.15 | 3.00 | 2.58 | 2.75 | 2.30 | 2.88 | 2.65 | 2.30 | 2.08 | 2.75 | 2.75 | 2.30 | 2.30 | 2.45 | 2.53 | 2.45 | 2.45 | 2.20 | 2.75 | [T]2.55 |
| Tacoma, Wash. [a] | 2.19 | 3.25 | 2.54 | 2.34 | 1.96 | 1.95 | 3.25 | 2.40 | 3.00 | 2.55 | 2.75 | 2.46 | 2.80 | 2.55 | 2.34 | 2.04 | [e]2.75 | [e]2.75 | 2.34 | 2.68 | 2.49 | * | 2.45 | 2.52 | 2.20 | 2.75 | 2.05 |
| Toledo, Ohio [ff] | 2.55 | [EE]2.86 | 2.76 | 2.58 | 1.92 | 1.92 | [EE]2.86 | 2.04 | 2.76 | ..... | §2.63 | 2.76 | 2.76 | 2.75 | §[75]2.28 | §2.13 | 2.75 | 2.75 | 2.36 | 2.36 | 2.50 | * | 2.63 | 2.63 | [76]2.50 | 2.76 | [77]1.80 |
| Topeka, Kans. [c] | 2.00 | 3.00 | 2.30 | 2.30 | 1.25 | 1.20 | 3.00 | 1.50 | 2.50 | 3.00 | 2.50 | 2.13 | 2.00 | 2.25 | 2.00 | [L]2.00 | 2.38 | 2.38 | 1.85 | 1.88 | 2.13 | * | 1.88 | 2.13 | 1.75 | 2.13 | [73]1.35 |
| Trenton, N. J. [hh] | 2.65 | 3.10 | [f]3.00 | [f]3.00 | 1.80 | 1.80 | 3.10 | ..... | 3.10 | 3.10 | 3.10 | 3.10 | 2.65 | 3.25 | 2.25 | 2.24 | 3.00 | 3.00 | 2.75 | 2.75 | 3.00 | ..... | [e]3.25 | [e]3.25 | [e]2.50 | [e]3.25 | ..... |
| Tulsa, Okla. [jj] | 2.45 | 3.25 | 2.25 | 2.25 | 1.45 | 1.45 | 2.50 | 1.60 | 3.00 | 2.50 | 2.50 | 2.65 | 3.00 | 2.50 | 2.00 | 2.00 | 2.50 | 2.50 | 2.00 | 2.00 | 2.25 | ..... | 1.90 | 2.15 | 1.90 | 2.15 | 1.65 |
| Youngstown, O. [gg] | 2.50 | 2.88 | 2.73 | 2.73 | 1.78 | 1.78 | 2.88 | ..... | [19]2.55 | 2.50 | 2.50 | 2.50 | [19]2.55 | 2.68 | 2.38 | 2.45 | 2.68 | 2.68 | 2.50 | ..... | 2.50 | * | [19]2.57 | [19]2.57 | * | 2.57 | 1.88 |

NOTE: Rates rounded to nearest cent * Same as craft doing work † 7-hr day ∦ 6-hr day ‡ Per week § Negotiating new rate [1] Automatic inc eff 5/51 all rates [2] Subj to 10–25¢ inc eff 5/51, wage board permitting [3] Bay area counties [4] Expect $2 on 6/51 [5] $2.13 eff 5/51 [6] $2.25 eff 3/51 [7] Expect $2.75 eff 5/51 [8] $2.60 eff 5/51 [9] $2.75 eff 7/51 [10] Rodmen [11] $2.35 eff 3/51 [12] Unskilled, $1.55 eff 5/51. Skilled $1.55, $1.65 eff 5/51 [13] 5¢ inc eff 3/15/51 [14] $1.50 eff 3/51 [15] $1.85 eff 5/51 [16] Skilled. [17] $2.60 eff 5/51 [18] $2.40 eff 7/51 [19] Expect 13¢ inc on 5/51 [20] Hard [21] $2.55 eff 4/51 [22] $2 eff 5/51 [23] Cost of living escalators [24] $2.40 eff 5/51 [25] $2.25 eff 7/51. [26] Expect $2 soon [27] Eff 2/26/51 [28] Expect $2.65 eff 5/51 [29] Brush. Spray $3.70, steel $2.10 [30] Brush. Spray $2 [31] Brush. Spray $2.70 [32] Brush. Spray $2.15, steel $2.03 [33] $2.20 eff 4/51 [34] $2.45 eff 4/51 [35] Brush. Spray $2.05 [36] Spray $2.15 [37] Brush. Scaffold & steel $2.27 [38] Spray. Brush $2.50 [39] Indefinite [40] Handled by shops. [41] Outside. Inside $1.55 [42] $2.70 plus 10¢ WF eff 4/51 [43] Man. & Bx.; Bklyn. & Queens $3.10 plus 3% WF & 2% PF [44] Slate & tile [45] Blt.-up. Tile $2.25 [46] Slate & tile $2.83. Negotiating [47] Tile $2 [48] Blt.-up. Comp. $1.75, slate & tile $2 [49] Comp. Slate & tile $1.93 [50] Comp. Slate & tile $2.38 [51] Comp. Slate, tile, & asb. $1.75 [52] $2.25 eff 5/51 [53] Inside. Outside $6 [54] $110/wk [55] Steel. Gen. $1.98 [56] Min. [57] Light [58] Wkly; $2.90 daily. Rates retro. 5/50–4/52 [59] Steel. Gen. $2.23 [60] Heavy [61] $120/wk [62] 40-hp $2.40 [63] Over 40-hp $1.75 [64] Tr. & boom $2.44, tandem $2.59 [65] $140/wk [66] Light $1.20 [67] Semi-trailers $1.70 [68] Over 3T $1.38 [69] Over 3T $1.35 [70] Bbl. Dump $1.45, lowbed trailer $1.80 [71] Under 6T [72] Over 2½T $1.68 [73] Over 5T $1.45 [74] $3 plus 5% bonus eff 7/5/51 [75] Brush. Spray $2.58 [76] Bulldozers [77] Dump. Flat bottom $1.80, winch $1.90 [78] New contract. Old work $2.50 [79] $2.20 eff 4/52 [80] $3.25 plus 3% WF eff 4/51 [81] $3.35 plus 3% WF eff 4/51 [82] Com'l & Ind over 20 ft, $2.90. Struct $3.15.

OVERTIME: [a] DT [b] DT Sat, Sun, & Hol [c] DT Sat & Sun: carp, struct, mos & ter, tile, paint [d] DT brick, iron, oper eng [e] DT brick, iron, elect, plumb, steamf. [f] DT brick, iron, stone mas & help, mos & ter, tile, cement; (DT Sat, Sun & Hol) plumb [g] DT iron; (DT Hol) brick, paint; (DT Sun) all others but carp, bldg lab, plast. [h] DT carp, brick, iron, stone mas, plast, mos & ter, tile, lath, elect, plumb, steamf, sheet met, weld [i] DT all but lab, mas help, mos & ter, tile, cement, elect, plumb, steamf, roof, waterp, tr driv [j] Dt carp, brick, stone mas, plast, mos & ter, tile, cement, lath, elect, steamf, plumb [k] DT carp, brick, iron, stone mas & help, plast, lath, plumb, steamf; (DT Sun & Hol) lab, mos & ter, tile. [l] DT iron [m] DT iron, plumb [n] DT carp, brick, iron, stone mas, plast, mos & ter, tile, lath, sheet met, oper eng; (DT Sat, Sun, & Hol) plumb [o] DT carp, brick, iron, stone mas & help plast, lath, plumb, steamf; (DT Sun & Hol) lab, mos & ter, tile, paint, roof, waterp, sheet met, oper eng, tr driv [p] DT all but lab, mas help, elect, tr driv [q] DT all but (DT Sun & Hol) mos & ter, glaz, tr driv; (TH M-F 7–8 a.m., 4:30–6:30 p.m.) lab; (TH M-F 4.30–7 p.m.) cement; (TH M-F 5–12 mid) paint [r] DT all but lab, cement, paint, roof, waterp, tr driv [s] DT all but tr, driv; (TH first 2½ hr) lab, lath; (TH 4:30–5:45 p.m.) mos & ter [t] DT all but carp, stone mas, paint [u] DT all but (DT Sun & Hol) lab, mas help, cement, glas, roof, waterp, sheet met, oper eng, tr driv [v] DT all but lab, paint, roof, waterp, oper eng, tr driv [w] DT all but (DT 4:30 p.m. F–6:30 a.m. M & Hol) bldg lab; (DT mid–8 a.m., Sat, Sun & Hol) hvy lab, paint; (DT Hol) plumb & steamf; (DT Sun & Hol) roof & waterp; (DT 6 p.m. Sat 7–a.m. M & Hol) tr driv [x] DT all but lab, mas help; (DT Sun & Hol) carp, paint, glas, roof, waterp, sheet met, oper eng, tr driv [y] DT all but (DT Sun & Hol) lab, mas help, roof, tr driv [z] DT all but lab, mas help, mos & ter, tile, cement, elect, paint, glas, plumb, steamf, sheet met, weld, tr driv [aa] DT all but (DT Sat, Sun, & Hol) lab [bb] DT all but cement, sheet met, oper eng, tr driv; (TH Oct–Apr) roof & waterp [cc] DT all but (DT Sun) hvy lab [dd] DT all but (TH first 4 hr) carp, lab, tr driv; (DT Sun) mos & ter; (DT Sat & Sun) paint; (TH first 2 hr) cement, glas, roof, waterp [ee] DT all but (TH week-days) cement, elect, glas, tr driv [ff] DT all but (TH week-days) oper eng; (DT Sun) tr driv [gg] DT all but tr driv; (TH week-days) carp, lab, mos & ter, glaz, plumb, sheet met [hh] DT all but paint, glas [ii] DT all but bldg lab, mas help, elect; (DT Sun & Hol) hvy lab [jj] No data given.

RANGES: [A] 0.85–0.90 [B] 0.85–1 [C] 0.95–1.05 [D] 1–1.15 [E] 1.15–1.25 [F] 1.28–1.50 [G] 1.48–2.63 [H] 1.50–2 [I] 1.52–1.87 [J] 1.57–2.07 [K] 1.60–1.80 [L] 1.65–2 [M] 1.80–1.90 [N] 1.83–1.95 [O] 1.88–2.13 [P] 1.90–2.10 [Q] 2–2.54 [R] 2.10–2.35 [S] 2.10–2.40 [T] 2.10–2.55 [U] 2.13–2.50 [V] 2.19–2.44 [W] 2.25–2.50 [X] 2.38–2.70 [Y] 2.40–2.65 [Z] 2.50–2.75 [AA] 2.60–2.80 [BB] 2.75–3 [CC] 3–3.50 [DD] 3.03–3.28 [EE] 2.86–3.

BENEFITS: [a] Incl 5% WF [b] Incl 10¢ WF [c] Incl $1/straight time day WF [d] Incl 1-wk pd vacation [e] Incl 3% vacation stamps [f] Incl 4% vacation fund [g] Plus 1% PF [h] Plus 5¢ WF [i] Plus 7½¢ WF [j] Plus 9¢ WF [k] Plus 21¢ WF [l] Plus 1% WF [m] Plus 2% WF [n] Plus 2½% WF [o] Plus 3% WF [p] Plus 4% WF [q] Plus 3% WF, 3% PF [r] Plus 3% WF, 20¢ PF [s] Plus 3% WF, 6 PH [t] Plus 3% WF, 8% add. [u] Plus 4% WF, 2% PF [v] Plus 4% W&PF, 6 PH [w] Plus 4% wkly bonus for hosp etc. [x] Plus 12½¢ vacation fund [y] Plus 11¢ PF & 10¢ WF [z] Plus 10¢ WF



*Installation and shop views of Bascule type Crest Gates*

# *Bascule* Crest Gates by SMITH

Pioneering and constantly progressing, we now offer this new type gate which fills a long existing need in pond level and flood control applications. The Bascule Gate is, in essence, an automatic flash board, hydraulically or electrically operated.

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# Labor Conditions outside USA

### NORTH AMERICA & WEST INDIES

- **Anchorage, Alaska:** Construction labor is adequate when the weather permits only inside work, which does not require too many men. Construction season starts in May and the prospect now is that either wages or hours (permitting overtime) must be increased to bring needed men to Alaska.
- **Havana, Cuba:** Construction labor is plentiful.
- **San Juan, Puerto Rico:** Construction labor is plentiful with a fair supply of skilled labor. New schools operating to train bricklayers and other construction workers will increase the supply.

### EUROPE

- **London, England:** Construction labor fairly plentiful but scarce in some localities. No unemployment. The June shortage of good timbermen and men experienced in operating pile-driving equipment no longer exists.
- **Stockholm, Sweden:** Has a shortage of skilled bricklayers but common labor shortages are even more critical. These materials, not shortages held down construction in the past year.
- **Madrid, Spain:** Construction labor is plentiful. Unemployment rose for 52,589 in Feb. 28, 1950 to 53,220 Nov. 30, 1950.
- **Paris, France:** No shortage of construction labor in December, but almost full employment. Some shortages, particularly on skilled workmen, are expected by the end of 1951 as a result of recruiting 200,000 new men into the army this year.
- **Amsterdam, Netherlands:** The sufficient supply of labor in June changed to a temporary shortage of skilled labor as a result of the additional construction of 7,000 houses by Nov. over the 45,000 planned for 1950. This shortage will be prevented in 1951 by curtailing construction licenses. Registered unemployed workers, mainly unskilled, dropped from 10,017 in April to 6,341 in Oct., 1950.
- **Frankfort, Germany:** Considerable unemployment in June changed to shortages of manpower, particularly masons, in Dec. However, workers are still available among refugees from the east but lack of housing prevents rational relocation of the unemployed.
- **Milan, Italy:** Construction workers still plentiful and will likely continue so despite rearmament plans.

### SOUTH AMERICA

- **Bogota, Colombia:** Construction labor is plentiful.
- **Lima, Peru:** Construction labor is plentiful.
- **Rio de Janeiro, Brazil:** Moderately plentiful supply of construction labor but, due to the growing inflation, builders report they have had to increase rates sharply to get production out of the workers.
- **Santiago, Chile:** Scarcity of skilled labor in June changed to an adequate supply of construction workers by Dec. 1950.
- **Buenos Aires, Argentina:** In June construction labor was scarce particularly on private jobs, since official government projects absorbed most of the manpower. By Dec. labor was still not as available as desired, but common labor was reasonably plentiful, with a scarcity of skilled labor.

### AFRICA, ASIA AND AUSTRALIA

- **Cairo, Egypt:** Common construction labor is plentiful but a shortage of skilled workers prevails due to much new work. Quality of local common labor is inferior to Europe or the U. S. because workers are mostly inexperienced and recruited haphazardly whenever needed.
- **Johannesburg, South Africa:** Construction labor in December, 1950 is plentiful at standard wages, whereas in past years employees wanted wages above normal.
- **Haifa, Israel:** Due to its recent waves of immigration, common construction labor is plentiful, but skilled labor is in very short supply and receives higher wages than are set up in union contracts with employers.
- **Bombay, India:** Construction labor is plentiful, particularly on most heavy work which is done by unskilled coolies.
- **Tokyo, Japan:** Common construction labor is plentiful but skilled labor is scarce and will continue so.
- **Manila, Phillipines:** Construction labor is plentiful.
- **Melbourne, Australia:** Construction labor is scarce. On large projects Australia advertises for contractors to bid who can import workers.

# Construction wages outside the United States

## Rates, converted to U. S. dollars, in June, 1950 and Dec., 1950

### NORTH AMERICA

| City and country | Exch rate U.S.$ | Common labor Bldgs June | Common labor Bldgs Dec | Common labor Hvy constr June | Common labor Hvy constr Dec | Carpenters June | Carpenters Dec | Bricklayers June | Bricklayers Dec | Struct iron workers June | Struct iron workers Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Anchorage, Alaska[a] | $1 | $2.37 | $2.42 | $2.40 | $2.42 | $2.70 | $2.92 | $3.57 | $3.57 | $3.05 | $3.05 |
| Montreal, Canada[b] | $0.91 | 0.82 | 0.91 | 0.73 | 0.77 | 1.14 | 1.27 | 1.27 | 1.46 | 1.14 | 1.37 |
| San Francisco, USA | $1 | 1.55 | 1.55 | 1.55 | 1.55 | 2.23 | 2.38 | 3.00[g] | 3.00[g] | 2.50 | 2.50[g] |
| New York City, USA | $1 | 1.70 | 1.90 | 1.70 | 1.90 | 2.75[f] | 3.09[f] | 3.20[i] | 3.55[h,i] | 3.00 | 3.35[i] |
| Mexico City, Mex.[c] | 10.95p | 0.06 | 0.07 | 0.08 | 0.09 | 0.22 | 0.22 | 0.17 | 0.22 | 0.17 | 0.17 |
| Havana, Cuba | $1 | 0.51 | 0.51 | .... | .... | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| San Juan, Puerto Rico[d] | $1 | 0.45 | 0.65 | 0.45 | 0.65 | 0.75 | 0.75–1.00 | 0.75 | 0.75–1.00 | 0.75 | 0.75–1.00 |

[a] 2¢/hr inc eff 1/51 for all but bricklayers, now negotiating [b] Ind cost of living bonus [c] Pd. 7 days, work 6, hourly rate not adj. for extra day [d] Wages 25% + inc over legal min [f] Incl 3% WF [g] 8-hr day [h] Incl 3% WF & 20¢ PF [i] 7-hr day

### SOUTH AMERICA

| City & country | Exch rate = U.S.$ | Common labor Bldgs June | Common labor Bldgs Dec | Common labor Hvy constr June | Common labor Hvy constr Dec | Carpenters June | Carpenters Dec | Bricklayers June | Bricklayers Dec | Struct iron workers June | Struct iron workers Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bogota, Colombia | 1.96 p | $0.15 | $0.25 | $0.15 | $0.30 | $0.26 | $0.49 | $0.26 | $0.39 | $0.71 | $[f] |
| Lima, Peru | 15 sol | 0.07 | 0.10 | 0.10 | 0.11 | 0.15 | 0.15 | 0.15 | 0.15 | 0.22 | 0.20 |
| Rio de Janeiro, Brazil | 20 cr | 0.20 | 0.23 | 0.15 | 0.23 | 0.30 | 0.45 | 0.30 | 0.45 | 0.40–0.50 | 0.50 |
| Santiago, Chile | 60 p | 0.16 | 0.16 | 0.16 | 0.20 | 0.26 | 0.31 | 0.20 | 0.25 | 0.20[e] | 0.25 |
| Buenos Aires, Argentina* | [d] | 0.30 | 0.23 | 0.30 | 0.23 | 0.38 | 0.28 | 0.38 | 0.28 | 0.42 | 0.31 |

[a] By law, all work over 8 hr pd. double stand. wages [b] 48-hr week [c] 44-hr week. Half-day Sat. Wages quoted in national currency are per day [d] June, 14.2 p; Dec. 9.02 p [e] Hardly exist [f] No data given * Plus 75% to cover workman's insurance and other social charges.

### EUROPE

| City & country | Exch rate = U.S.$ | Common labor Bldgs June | Common labor Bldgs Dec | Common labor Hvy constr June | Common labor Hvy constr Dec | Carpenters June | Carpenters Dec | Bricklayers June | Bricklayers Dec | Struct iron workers June | Struct iron workers Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| London, England | $2.80/£ | $0.35 | $0.36 | $0.36 | $0.36 | $0.42 | $0.42 | $0.42 | $0.42 | $0.41 | $0.41 |
| Stockholm, Sweden[a] | 5.18k | 0.68 | 0.68 | 0.72 | 0.72 | 0.97 | 0.97 | 1.06 | 1.06 | 0.72 | 0.72 |
| Madrid, Spain[b] | 10.95p | 0.18 | 0.23 | 0.27 | 0.32 | 0.41 | 0.46 | 0.41 | 0.46 | 0.37 | 0.11 |
| Paris, France | 346 fr | 0.32 | 0.34 | 0.37 | 0.41 | 0.76 | 0.78 | 0.61 | 0.63 | 0.51 | 0.53 |
| Amsterdam, Netherlands | 3.80 gld | 0.23 | 0.24 | 0.25 | 0.26 | 0.29 | 0.31 | 0.29 | 0.31 | 0.28 | 0.29 |
| Frankfort, Germany | 4.20Dm | 0.29 | 0.32 | 0.32 | 0.35 | 0.34 | 0.38 | 0.34 | 0.38 | 0.34 | 0.38 |
| Milan, Italy[c] | 618 lire | 0.31 | 0.38 | 0.31 | 0.38 | 0.34 | 0.45 | 0.34 | 0.45 | 0.34 | 0.45 |

[a] Aver. of actual earnings. No fixed wage; comb. of hourly wage plus piecework [b] Incl 25% cost of living allow. Overtime—25% inc first 2 hr, 40% next 2 hr [c] Dec. rates in Rome. % calc. on June rates in Milan. 2 deduct: 1 social welf.; 1 Xmas bonus. Pd. for 4-wk months, 13th pd. at Xmas [d] 44-hr week [e] Sat. 5½ hr

### AFRICA, ASIA, AUSTRALIA

| City & country | Exch rate = U.S.$ | Common labor Bldgs June | Common labor Bldgs Dec | Common labor Hvy constr June | Common labor Hvy constr Dec | Carpenters June | Carpenters Dec | Bricklayers June | Bricklayers Dec | Struct iron workers June | Struct iron workers Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cairo, Egypt[a] | $2.85/£E | $0.71 | $0.71 | $1.14 | $1.71 | $2.28 | $2.57 | $2.57 | $2.71 | $2.85 | $2.85 |
| Johannesburg, So. Africa | $2.80/£ | 0.15 | 0.17 | 0.17 | 0.17 | 0.76 | 0.85 | 0.76 | 0.85 | 0.76 | 0.85 |
| Haifa, Israel[b] | $2.80/I£ | 0.88 | 0.88 | .... | .... | 1.22 | 1.22 | 1.22 | 1.22 | .... | .... |
| Bombay, India | $.21/R | 0.07 | 0.08 | 0.08 | 0.10 | 0.13 | 0.20 | 0.13 | 0.16 | 0.13 | 0.24 |
| Tokyo, Japan | 360Y | 0.09 | 0.10 | 0.09 | 0.10 | 0.16 | 0.16 | 0.17 | 0.17 | 0.14 | 0.15 |
| Manila, Philippines | 200p | 0.22 | 0.22 | 0.22 | 0.22 | 0.41 | 0.41 | .... | .... | 0.50 | 0.50 |
| Melbourne, Australia | $2.12/£ | 0.51 | 0.59 | 0.51 | 0.59 | 0.62 | 0.70 | 0.62 | 0.72 | 0.44[f] | 0.48[f] |

[a] Wages quoted are per day [b] Labor union rates quoted (per day in national currency). Rise due Jan. 1, negotiating [c] Weekly rates [d] 41-hr week of 5 days [f] Data for factory worker. Rigger on job: £11/2/6 ($0.62). 14% inc over June ($0.54)

## Rates, in national currencies, in Dec. 1950 & change from June 1950

### SOUTH AMERICA

| City & country | Std work day hrs | Common labor Bldgs Dec | Common labor Bldgs % chg J–D | Common labor Hvy constr Dec | Common labor Hvy constr % chg J–D | Carpenters Dec | Carpenters % chg J–D | Bricklayers Dec | Bricklayers % chg J–D | Struc iron workers Dec | Struc iron workers % chg J–D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bogota, Colombia (peso) | 8 | .48 | 60 | .58 | 93 | .96 | 92 | .76 | 52 | • | .... |
| Lima, Peru (sole) | 8[a] | 1.50 | 25 | 1.60 | 7 | 2.20 | 0 | 2.20 | 0 | 3. | -9 |
| Rio de Janeiro, Brazil (cruzeiro) | 8 | 4.50 | 13 | 4.50 | 50 | 9.0 | 50 | 9.0 | 50 | 10.0 | 25 |
| Santiago, Chile (peso) | 8[b] | 9-11 | 0 | 11-13 | 0 | 18-20 | 20-11 | 14-16 | 17-33 | 14-16[e] | 17-33 |
| Buenos Aires, Argentina (peso) | 8[c] | 25.50 | 19 | 25.50 | 19 | 32 | 19 | 32 | 19 | 35 | 17 |

### EUROPE

| City and country | Std work day hrs | Common labor Bldgs Dec | Common labor Bldgs % chg J–D | Common labor Hvy constr Dec | Common labor Hvy constr % chg J–D | Carpenters Dec | Carpenters % chg J–D | Bricklayers Dec | Bricklayers % chg J–D | Struct iron workers Dec | Struct iron workers % chg J–D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| London, England (shillings, pence) | 8[d] | 2/6½ | 2 | 2/6½ | 0 | 3/- | 0 | 3/- | 0 | 2/11½ | 0 |
| Stockholm, Sweden[a] (kronor) | 8½[e] | 3.5 | 0 | 3.75 | 0 | 5.0 | 0 | 5.5 | 0 | 3.75 | 0 |
| Madrid, Spain[b] (pesata) | 8 | 2.5 | 25 | 3.5 | 17 | 5.0 | 11 | 5.0 | 11 | 4.5 | 13 |
| Paris, France (franc) | 8 | 119.0 | 6 | 141.5 | 9 | 271.0 | 3 | 219.0 | 4 | 184.0 | 5 |
| Amsterdam, Netherlands (guilder) | 8½[e] | 0.93 | 5 | 0.99 | 6 | 1.18 | 6 | 1.16 | 6 | 1.10 | 5 |
| Frankfort, Germany (Deitschmark) | 8½[e] | 1.34 | 10 | 1.49 | 12 | 1.58 | 10 | 1.58 | 10 | 1.58 | 10 |
| Milan, Italy[c] (lire) | 8 | 237.2 | 23 | 237.2 | 23 | 276.8 | 32 | 276.8 | 32 | 276.8 | 32 |

### AFRICA, ASIA, AND AUSTRALIA

| City & country | Std work day hrs | Common labor Bldgs Dec | Common labor Bldgs % chg J–D | Common labor Hvy constr Dec | Common labor Hvy constr % chg J–D | Carpenters Dec | Carpenters % chg J–D | Bricklayers Dec | Bricklayers % chg J–D | Struct iron workers Dec | Struct iron workers % chg J–D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cairo, Egypt[a] (Egypt. pound) | 8 | 00.25 | 0 | 00.60 | 50 | 00.90 | 13 | 00.95 | 6 | 1.00 | 0 |
| Johannesburg, So. Africa (pence) | 8[d] | 14½ | 12 | 14½ | 0 | 73 | 11 | 73 | 11 | 73 | 11 |
| Haifa, Israel[b] (Israeli pound) | 8 | 2.500 | 0 | .... | .. | 3.500 | 0 | 3.500 | 0 | .... | .. |
| Bombay, India (Rupee, anna, pie) | 8 | –/6/6 | 30 | –/8/– | 33 | –/15/– | 50 | –/12/– | 20 | 1/2/6 | 85 |
| Tokyo, Japan (yen) | 8 | 37.5 | 20 | 38.5 | 20 | 56.3 | 0 | 62.5 | 0 | 53.8 | 8 |
| Manila, Philippines (peso) | 8 | .44 | 0 | .44 | 0 | .82 | 0 | .... | .. | 1.00 | 0 |
| Melbourne, Australia[c] (pound, shilling, pence) | 8[d] | 10/13/4 | 16 | 10/13/4 | 16 | 12/12/6 | 12 | 12/12/6 | 12 | 8/11/–[f] | 7 |

For footnotes see corresponding table in first group.

## Construction financing

Easy money prevailed in 1950 with continuation of Federal Reserve support of federal bonds. When this support was withdrawn in March 1951 federal bond prices broke, but recovered. Higher income taxes, passed in the fall of 1950, favored municipals as the yields show.

Municipal bond interest rates, measured by yields, averaged 1.62% for January, 1951, compared with 2.08% a year before and 2.28%, in June, 1949. These rates compare with 4.71% at their depression high in 1933 and with 1.64% in 1946.

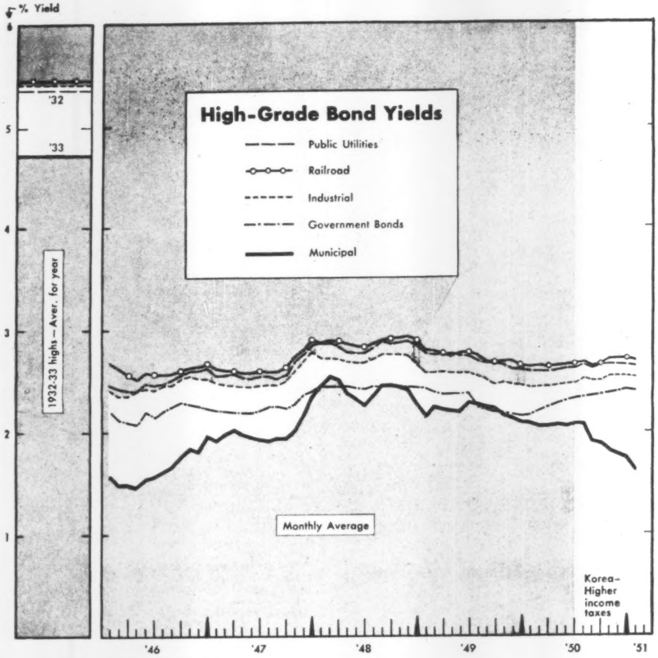
A 1 plus industrials yielded 2.64% in January, 1951, compared with 2.42% a year before, 2.59% in March, 1949, and 5.40% at their depression high in 1932.

Construction borrowing costs reached their lowest in 1946 then climbed to a postwar high in 1948. Municipals in January, 1951, were down 22% but industrials were back up within 0.2% of their 1948 tops.

### Bond yields—per cent

| | Govt.† (1) | U. S. Treas. (2) | Municipal (3) | Industrial (4) | Pub. Util. (5) | Railroad (6) |
|---|---|---|---|---|---|---|
| 1933 | | 3.31 | 4.71 | 4.98 | 4.69 | 4.55 |
| 1934 | | 3.12 | 4.03 | 4.28 | 4.19 | 4.01 |
| 1935 | | 2.79 | 3.41 | 3.73 | 3.59 | 3.58 |
| 1936 | | 2.69 | 3.07 | 3.34 | 3.38 | 3.31 |
| 1937 | | 2.74 | 3.10 | 3.16 | 3.22 | 3.45 |
| 1938 | | 2.61 | 2.91 | 2.82 | 2.99 | 3.60 |
| 1939 | | 2.41 | 2.76 | 2.64 | 2.83 | 3.39 |
| 1940 | | 2.26 | 2.50 | 2.57 | 2.75 | 3.26 |
| 1941 | | 2.05 | 2.10 | 2.50 | 2.69 | 3.16 |
| 1942 | 2.27 | 2.09 | 2.36 | 2.54 | 2.71 | 3.17 |
| 1943 | 2.29 | 1.98 | 2.06 | 2.55 | 2.63 | 3.10 |
| 1944 | 2.38 | 1.92 | 1.86 | 2.58 | 2.64 | 3.01 |
| 1945 | 2.34 | 1.66 | 1.67 | 2.50 | 2.59 | 2.75 |
| 1946 | 2.19 | Disc | 1.64 | 2.44 | 2.50 | 2.59 |
| 1947 | 2.24 | | 2.01 | 2.52 | 2.59 | 2.62 |
| 1948 | 2.43 | | 2.40 | 2.70 | 2.83 | 2.89 |
| 1949 | 2.28 | | 2.21 | 2.53 | 2.69 | 2.71 |
| 1949 | | | | | | |
| J | 2.40 | | 2.15 | 2.58 | 2.77 | 2.78 |
| F | 2.38 | | 2.23 | 2.58 | 2.75 | 2.77 |
| M | 2.37 | | 2.21 | 2.59 | 2.75 | 2.75 |
| A | 2.37 | | 2.20 | 2.57 | 2.75 | 2.74 |
| M | 2.37 | | 2.20 | 2.57 | 2.74 | 2.75 |
| J | 2.37 | | 2.28 | 2.57 | 2.73 | 2.76 |
| J | 2.24 | | 2.26 | 2.53 | 2.69 | 2.73 |
| A | 2.21 | | 2.20 | 2.50 | 2.66 | 2.66 |
| S | 2.19 | | 2.22 | 2.45 | 2.64 | 2.66 |
| O | 2.18 | | 2.21 | 2.47 | 2.64 | 2.66 |
| N | 2.16 | | 2.17 | 2.46 | 2.60 | 2.66 |
| D | 2.15 | | 2.13 | 2.44 | 2.60 | 2.63 |
| 1950 | | | | | | |
| J | 2.17 | | 2.08 | 2.42 | 2.59 | 2.62 |
| F | 2.22 | | 2.06 | 2.43 | 2.59 | 2.63 |
| M | 2.25 | | 2.07 | 2.43 | 2.59 | 2.62 |
| A | 2.28 | | 2.08 | 2.44 | 2.60 | 2.63 |
| M | 2.30 | | 2.07 | 2.46 | 2.62 | 2.65 |
| J | 2.33 | | 2.09 | 2.47 | 2.62 | 2.66 |
| J | 2.34 | | 2.09 | 2.51 | 2.66 | 2.68 |
| A | 2.35 | | 1.90 | 2.50 | 2.62 | 2.63 |
| S | 2.37 | | 1.88 | 2.50 | 2.65 | 2.66 |
| O | 2.38 | | 1.82 | 2.54 | 2.66 | 2.70 |
| N | 2.39 | | 1.79 | 2.54 | 2.66 | 2.71 |
| D | 2.41 | | 1.77 | 2.54 | 2.65 | 2.71 |
| 1951 | | | | | | |
| J | 2.40 | | 1.62 | 2.53 | 2.64 | 2.69 |

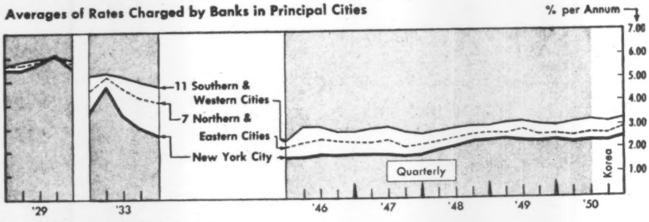
(1) †Standard Statistics & Poors—aver. long-term government bonds, taxable. To replace the long-term U. S. Treasury bonds series discontinued after December, 1945.
(2) Aver. yield of long-term U. S. Treasury bonds, partially tax exempt, not due or callable for fifteen years. Federal Reserve Bulletin.
Standard Statistics & Poors—
(3) aver. 15 high-grade long-term municipals.
(4) aver. A1 plus industrials.
(5) aver. A1 plus public utilities:
(6) aver. A1 plus railroads.



Data: Standard Statistics & Poors. Chart: ENR Business News

### Commercial Loan Rates

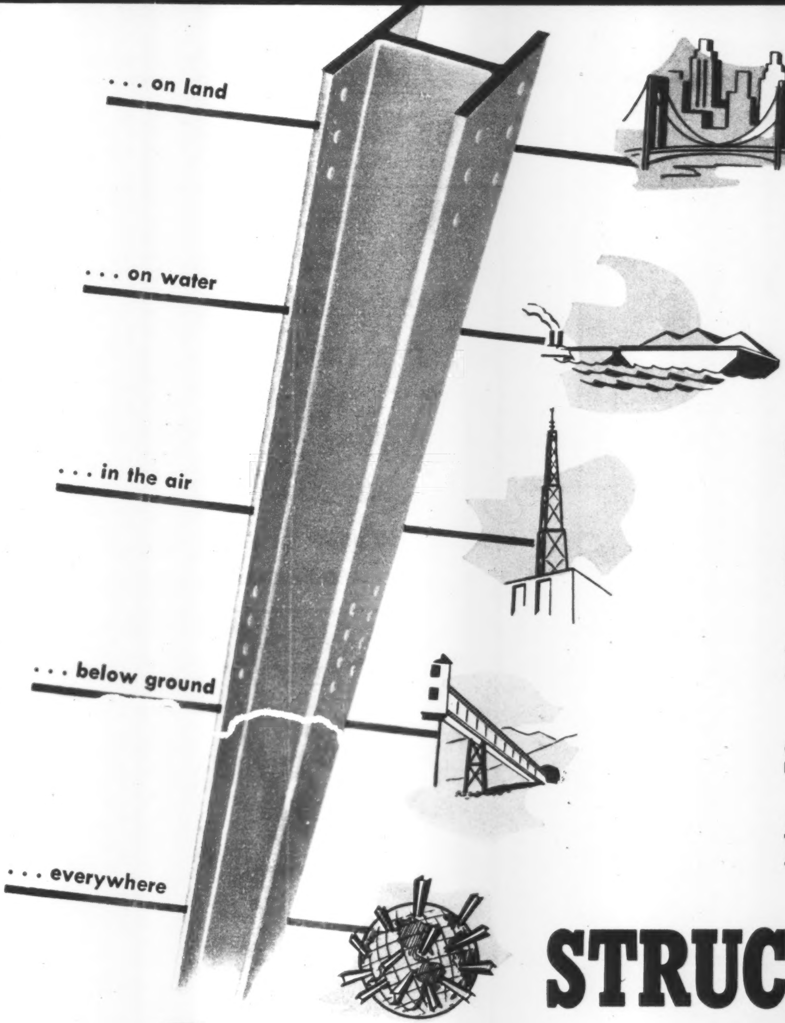
Averages of Rates Charged by Banks in Principal Cities



Data: Federal Reserve Board, Chart: ENR Business News

New wrinkles in financing public works in 1950 were aimed at lower rates. Use of state credit was the principal tool, but insurance companies made radical proposals, too.

- **California** proposed a $1-billion bond issue to enable the state to buy local bonds and sell its own state-credit-backed revenue bonds to get funds to pay for the local bonds. A ½% differential between state and local bond interest rates would finance the state's expenses. Gas, light and power projects would be excluded, but all other local public works would be eligible for this type of financing, if approved by the voters.
- **Pennsylvania** set up state Authorities and empowered them to sell revenue bonds, to build state and local public works and to rent them to the communities or state departments served to retire the bonds and pay the interest. The General State Authority thus finances, constructs, and rents public buildings. The State Public School Building Authority rents schools built for local authorities to their specifications, and The General State and Highway and Bridge Authority finances and rents highways and bridges to the State Highway Dept.
- **New York** proposes to place the state's credit behind $500 million in revenue bonds for the cross-state Thruway at a saving estimated at $15 million a year, from interest rated reduced from 3¼% to 2%.
- **Eight insurance companies** have proposed to communities in southern New Jersey that they finance new schools at a cost of 2%. Many New Jersey communities are selling school and other public works bonds considerably below this 2% rate.



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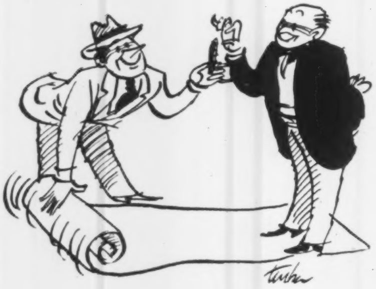
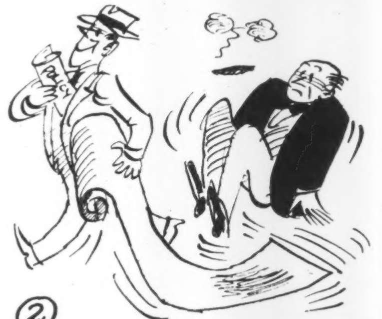


① SALESMEN WHO ROLL OUT THE CARPET FOR PROSPECTS



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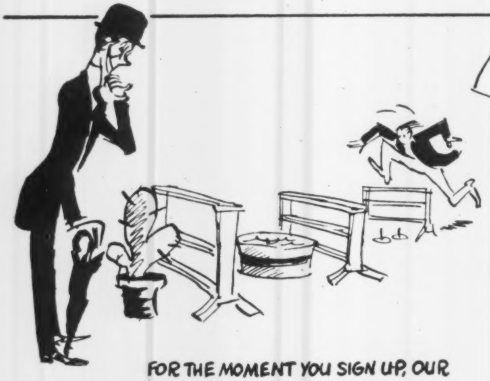

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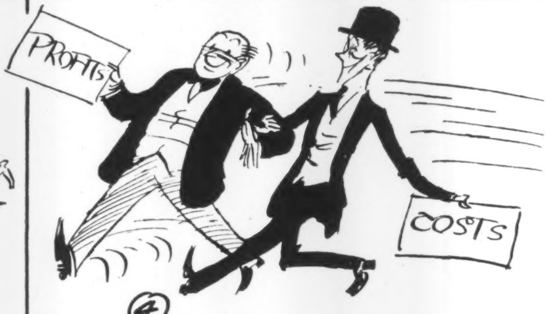

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# Base rates on compensation insurance for construction—January 1, 1951

Compiled by Herbert L. Jamison & Co., Insurance Advisers and Auditors, New York, N. Y. (Base rates in effect January 1, 1951—subject to increase or decrease according to experience ratings)

| Classification of work | Ala. | Alas. | Ariz. | Ark. | Calif. | Colo. | Conn. | Del. | D. C. | Fla. | Ga. | Idaho | Ill. | Ind. | Iowa | Kans. | Ky. | La. | Me. | Md. | Mass. | Mich. | Minn. | Miss. | Mo. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carpentry 1-2 family residences | $0.96 | $3.47 | $6.68 | $2.35 | $2.66 | $1.67 | $2.36 | $1.45 | $2.11 | $2.15 | $1.36 | $3.05 | $1.98 | $1.66 | $1.83 | $1.49 | $1.92 | $3.54 | $1.37 | $1.35 | $3.58 | $2.41 | $3.06 | $3.90 | $2.51 |
| Carpentry 3 stories or less | 1.22 | 3.95 | 6.68 | 3.33 | 3.53 | 1.67 | 2.45 | 1.45 | 2.13 | 2.15 | 1.36 | 3.05 | 2.11 | 2.20 | 2.21 | 1.98 | 1.92 | 3.94 | 1.72 | 1.81 | 3.58 | 2.41 | 3.06 | 3.90 | 2.51 |
| Carpentry interior trim, cabinet work | .62 | 2.34 | 6.68 | 1.71 | 3.53 | .89 | 1.80 | 1.45 | 1.88 | 1.13 | .88 | 1.51 | 1.15 | .85 | .94 | .97 | 1.14 | 1.89 | .81 | 1.24 | 1.81 | 1.72 | 3.06 | 1.84 | 2.51 |
| Carpentry general | 1.39 | 7.94 | 6.68 | 3.81 | 3.53 | 2.52 | 4.42 | 1.45 | 3.65 | 2.15 | 2.30 | 4.75 | 3.50 | 2.33 | 2.31 | 2.74 | 3.39 | 4.08 | 2.90 | 2.72 | 6.34 | 2.41 | 3.06 | 4.90 | 2.51 |
| Chimney construction, brick, concrete | 4.63 | 12.22 | 16.21 | 11.96 | 12.58 | 6.75 | 11.77 | A | 12.86 | 8.45 | 5.76 | 12.67 | 7.40 | 6.55 | 6.25 | 7.85 | 9.95 | 13.97 | 5.37 | 7.85 | 5.84 | 10.19 | 9.86 | 12.90 | 12.04 |
| Concrete work—bridges, culverts—C | 2.56 | A | A | 6.27 | 4.76 | 3.69 | 7.66 | 1.35 | 7.78 | 3.35 | 3.93 | 6.70 | 3.26 | 3.69 | 3.74 | 3.54 | 4.30 | 6.39 | 3.84 | 4.06 | 10.39 | 4.59 | 5.73 | 8.02 | 5.35 |
| Concrete work—3 stories or less—C | .62 | 6.75 | 4.94 | 1.81 | 1.26 | 1.90 | 3.25 | 1.35 | 3.21 | 1.70 | .75 | 2.43 | 1.62 | 1.16 | 1.21 | 1.74 | 1.17 | 2.03 | 1.67 | 1.44 | 4.38 | 1.46 | 1.68 | 2.40 | 1.70 |
| Concrete work—general—C | 1.46 | 7.14 | 4.94 | 2.99 | 2.46 | 3.10 | 4.44 | 1.35 | 3.56 | 2.44 | 2.06 | 4.94 | 2.46 | 1.57 | 1.75 | 2.93 | 2.26 | 3.88 | 1.67 | 2.32 | 6.01 | 2.55 | 2.24 | 3.82 | 3.12 |
| Concrete or cement walks, floors, yards | .76 | 2.76 | A | 1.81 | A | 1.09 | 2.12 | .95 | 1.57 | 1.49 | 1.08 | 1.87 | 1.09 | .98 | 1.03 | 1.48 | 1.28 | 2.34 | 1.01 | 1.58 | 2.32 | 1.18 | 1.41 | 2.01 | 1.79 |
| Electric wiring | 1.01 | 1.83 | 2.73 | 1.58 | 1.97 | 1.09 | 1.53 | 1.60 | 1.53 | 1.24 | 1.03 | 1.69 | 1.08 | .87 | 1.00 | 1.16 | 1.16 | 1.59 | .83 | 1.32 | 1.55 | 1.35 | 1.01 | 1.71 | 1.20 |
| Excavation—earth—D | 1.23 | 3.82 | 5.21 | 3.76 | 1.86 | 2.75 | 3.33 | .95 | 2.93 | 1.92 | 1.49 | 5.17 | 1.84 | 1.23 | 1.83 | 2.45 | 3.35 | 2.24 | 2.20 | 1.79 | 4.13 | 2.17 | 2.88 | 3.52 | 2.48 |
| Excavation—rock—E | 2.17 | 9.09 | 8.14 | 5.80 | 5.25 | 3.13 | 6.15 | 1.60 | 6.07 | 4.30 | 3.63 | 6.09 | 3.90 | 3.01 | 2.89 | 3.49 | 4.18 | 6.49 | 2.56 | 3.63 | 9.86 | 4.34 | 4.98 | 5.82 | 5.57 |
| Glazing | 1.76 | 4.33 | 6.08 | 4.32 | 4.10 | 2.50 | 4.75 | .70 | 4.37 | 3.28 | 2.35 | 4.45 | 2.90 | 2.33 | 2.51 | 2.77 | 3.33 | 5.16 | 2.16 | 2.91 | 4.60 | 3.87 | 3.86 | 4.66 | 3.18 |
| Insulating | .79 | 3.50 | A | 2.12 | 2.17 | 1.39 | 1.71 | A | 2.36 | 1.53 | .90 | 2.52 | 1.38 | 1.54 | 1.42 | 1.49 | 1.65 | 2.47 | 1.35 | 1.39 | 3.13 | 1.35 | 2.19 | 2.69 | 1.42 |
| Lathing | .82 | 3.50 | 3.62 | 2.25 | 2.17 | 1.17 | 2.32 | .65 | 2.03 | 1.65 | 1.16 | 2.05 | 1.17 | 1.13 | 1.22 | 1.29 | 1.53 | 2.47 | 1.06 | 1.41 | 2.93 | 1.47 | 1.55 | 2.43 | 2.09 |
| Masonry | .62 | 5.95 | 4.30 | 1.81 | 2.19 | 1.90 | 3.25 | .80 | 2.13 | 1.51 | .75 | 2.43 | 1.56 | 1.06 | 1.21 | 1.74 | 1.17 | 2.03 | 1.67 | 1.44 | 4.38 | 1.46 | 1.65 | 2.40 | 1.58 |
| Painting and decorating | 1.03 | 4.77 | 4.14 | 2.17 | 3.07 | 2.00 | 2.91 | 1.40 | 3.53 | 1.76 | 1.43 | 3.47 | 1.93 | 1.82 | 1.47 | 1.98 | 1.85 | 3.29 | 1.37 | 2.23 | 3.95 | 1.96 | 1.78 | 3.13 | 2.03 |
| Pile driving—building foundations | 4.15 | 9.10 | 17.11 | 11.57 | 10.48 | 6.56 | 5.34 | 3.25 | 9.65 | 5.27 | 4.90 | 11.39 | 6.21 | 5.61 | 4.66 | 7.26 | 8.30 | 12.89 | 2.67 | 5.43 | 6.22 | 8.53 | 7.06 | 12.53 | 10.87 |
| Plastering | .79 | 3.50 | 4.90 | 2.12 | 2.17 | 1.39 | 1.71 | .65 | 2.36 | 1.53 | .90 | 2.52 | 1.38 | 1.54 | 1.42 | 1.49 | 1.65 | 2.44 | 1.35 | 1.39 | 3.13 | 1.35 | 1.89 | 2.69 | 1.42 |
| Plumbing | .73 | 1.82 | 3.30 | 1.43 | 1.59 | 1.17 | 1.56 | .90 | 1.90 | 1.24 | 1.08 | 1.80 | 1.25 | .93 | 1.11 | 1.04 | 1.06 | 1.74 | .97 | 1.39 | 2.05 | 1.49 | 1.45 | 1.71 | 1.25 |
| Roofing | 2.77 | 8.95 | 7.67 | 5.98 | 6.23 | 4.41 | 6.52 | 1.60 | 6.35 | 3.34 | 2.92 | 8.53 | 4.24 | 3.97 | 5.85 | 5.08 | 4.35 | 5.41 | 4.79 | 4.65 | 13.35 | 6.08 | 5.34 | 7.50 | 6.49 |
| Sheet metal work | 1.20 | 3.04 | 4.08 | 2.89 | 2.40 | 1.57 | 2.13 | 1.60 | 2.48 | 2.02 | 1.38 | 2.56 | 1.85 | 1.21 | 1.59 | 1.60 | 1.85 | 3.04 | 1.24 | 1.45 | 2.36 | 1.46 | 1.68 | 2.98 | 1.53 |
| Steel erection—door and sash | 1.11 | 5.21 | 3.73 | 2.78 | 3.67 | 1.65 | 3.21 | 4.40 | 2.79 | 2.19 | 1.58 | A | 2.34 | 1.57 | 1.65 | 1.77 | 2.15 | 3.46 | 1.46 | 1.93 | 3.55 | 2.67 | 2.58 | 3.03 | 2.62 |
| Steel erection—interior ornament | 1.20 | 4.59 | 4.28 | 3.17 | 6.48 | 1.74 | 3.33 | 2.00 | 3.84 | 5.50 | 1.63 | A | 1.94 | 1.65 | 1.71 | 1.88 | 2.21 | 3.66 | 1.53 | 2.03 | 3.55 | 2.20 | 2.71 | 3.46 | 3.10 |
| Steel erection—structural | 6.13 | 19.60 | 22.34 | 12.71 | 12.83 | 10.99 | 15.66 | 4.40 | 20.67 | 9.46 | 7.70 | 17.14 | 5.95 | 5.45 | 8.64 | 9.44 | 12.52 | 8.94 | 7.62 | 5.89 | 20.02 | 12.12 | 8.43 | 14.64 | 10.08 |
| Steel erection—dwellings—2 stories | 2.77 | 10.77 | 8.84 | 6.75 | 6.48 | 4.30 | 7.78 | 4.40 | 6.98 | 5.11 | 3.91 | 7.82 | 5.15 | 3.15 | 3.92 | 4.80 | 5.91 | 6.51 | 3.97 | 4.87 | 20.02 | 5.36 | 5.82 | 8.15 | 7.21 |
| Steel erection—general | 4.07 | 11.05 | 22.34 | 12.63 | 6.48 | 6.75 | 8.83 | 4.40 | 15.48 | 5.83 | 6.61 | 12.15 | 6.45 | 3.07 | 7.08 | 5.90 | 7.25 | 8.94 | 5.40 | 5.89 | 15.29 | 5.93 | 7.23 | 13.39 | 5.23 |
| Tile work—interior | .54 | 1.11 | 2.30 | 1.46 | 1.21 | .77 | 1.55 | .45 | 2.11 | .84 | .81 | 1.30 | .79 | .72 | .81 | .83 | .97 | 1.53 | .73 | 1.01 | 1.73 | 1.30 | 1.19 | 1.57 | 1.01 |
| Timekeepers and watchmen | 1.22 | 5.95 | G | 2.65 | G | 1.74 | 3.45 | G | 2.88 | 2.30 | 1.72 | 2.95 | 2.23 | 1.65 | 1.78 | 1.88 | 2.16 | 3.67 | 1.56 | 2.04 | 3.83 | 2.36 | 2.74 | 2.87 | 3.11 |
| Waterproofing—brush | 1.03 | 4.77 | 4.14 | 2.17 | 3.07 | 2.00 | 2.91 | .80 | 3.53 | 1.76 | 1.43 | 3.47 | 1.93 | 1.82 | 1.47 | 1.98 | 1.85 | 3.29 | 1.37 | 2.23 | 13.95 | 1.96 | 1.78 | 3.13 | 2.03 |
| Waterproofing—trowel—interior | .79 | 3.50 | 4.90 | 2.12 | 2.17 | 1.39 | 1.71 | .80 | 2.36 | 1.53 | .90 | 2.52 | 1.38 | 1.54 | 1.42 | 1.49 | 1.65 | 2.44 | 1.35 | 1.39 | 3.13 | 1.35 | 1.89 | 2.69 | 1.42 |
| Waterproofing—trowel—exterior | .62 | 5.95 | 4.30 | 1.81 | 2.19 | 1.90 | 3.25 | .80 | 2.13 | 1.51 | .75 | 2.43 | 1.56 | 1.06 | 1.21 | 1.74 | 1.17 | 2.03 | 1.67 | 1.44 | 4.38 | 1.46 | 1.65 | 2.40 | 1.58 |
| Waterproofing—pressure gun | 1.46 | 7.14 | 4.94 | 2.99 | 2.46 | 3.10 | 4.46 | .80 | 3.56 | 2.44 | 2.06 | 4.94 | 2.46 | 1.57 | 1.75 | 2.93 | 2.26 | 3.88 | 1.67 | 2.32 | 6.01 | 2.55 | 2.24 | 3.82 | 3.12 |
| Wrecking | 6.71 | 15.99 | 28.43 | 17.25 | 15.95 | 10.10 | 15.63 | 9.00 | 16.41 | 10.20 | 8.36 | A | 8.20 | 6.18 | 9.87 | 7.68 | 12.33 | 19.17 | 8.67 | 9.21 | 21.41 | 19.21 | 10.99 | 18.73 | 12.52 |

| Classification of work | Mont. | Neb. | Nev. H | N. H. | N. J. | N. Mex. | N. Y. | N. Car. | N. Dak. H | Ohio H | Okla. | Ore. | Pa. | R. I. | S. Car. | S. Dak. | Tenn. | Texas | Utah | Vt. | Va. | Wash. | W. Vir. H | Wisc. | Wyo* H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carpentry 1-2 family residences | $2.61 | $2.40 | $3.58 | $1.87 | $2.45 | $1.99 | $5.97 | $1.46 | $2.96 | $1.75 | $3.42 | $6.36 | $1.30 | $2.92 | $2.17 | $1.40 | $1.31 | $2.27 | $1.70 | $1.70 | $1.22 | $4.59 | $1.92 | $3.48 | $1.50 |
| Carpentry 3 stories or less | 2.61 | 2.40 | 3.58 | 1.87 | 2.85 | 1.99 | 5.97 | 1.75 | 2.96 | 2.32 | 3.83 | 6.36 | 1.30 | 3.67 | 2.50 | 1.40 | 1.85 | 3.32 | 1.70 | 1.70 | 1.33 | 4.59 | 1.92 | 3.48 | 1.50 |
| Carpentry interior trim, cabinet work | 1.27 | 1.10 | 1.74 | 1.09 | 1.60 | .95 | 5.97 | 1.19 | 2.96 | .90 | 2.24 | 2.94 | 1.30 | 2.81 | 1.67 | 1.05 | 1.15 | 1.95 | 1.70 | .81 | .69 | 1.50 | 1.14 | 3.48 | A |
| Carpentry general | 4.19 | 3.02 | 5.74 | 3.23 | 3.20 | 2.56 | 5.97 | 2.61 | 2.96 | 2.43 | 4.73 | 7.49 | 1.30 | 6.64 | 6.33 | 1.43 | 2.34 | 3.32 | 1.70 | 2.34 | 1.77 | 6.08 | 3.39 | 3.48 | 1.50 |
| Chimney construction, brick, concrete | 11.79 | 8.19 | 16.15 | 7.86 | 8.10 | 7.02 | 23.28 | 8.35 | 9.53 | 6.90 | 16.73 | A | A | 24.03 | 14.28 | 5.73 | 8.08 | 12.53 | 9.57 | 5.64 | 4.41 | A | 9.95 | 12.68 | 8.42 |
| Concrete work—bridges, culverts—C | 5.86 | 4.49 | 8.03 | 5.34 | 3.90 | 4.59 | 8.94 | 3.89 | 5.54 | 3.89 | 9.96 | 9.84 | 1.50 | 12.55 | 9.65 | 3.94 | 2.39 | 3.32 | 5.13 | 3.55 | 2.26 | 7.57 | 4.30 | 5.99 | 4.51 |
| Concrete work—3 stories or less—C | 2.06 | 1.56 | 2.82 | 2.34 | 3.40 | 1.38 | 6.39 | 1.07 | 1.62 | 1.22 | 3.62 | 5.83 | 1.50 | 3.60 | 1.66 | 1.26 | 1.01 | 3.32 | 2.30 | 1.90 | .80 | 4.48 | 1.17 | 1.89 | 1.87 |
| Concrete work—general—C | 3.81 | 2.55 | 5.22 | 4.19 | 3.90 | 2.24 | 6.39 | 2.35 | 2.17 | 1.65 | 5.65 | 6.69 | 1.50 | 6.47 | 3.80 | 2.17 | 2.39 | 3.32 | 3.11 | 1.99 | 1.43 | 5.15 | 2.26 | 2.69 | 2.74 |
| Concrete or cement walks, floors, yards | 1.57 | 1.18 | 2.15 | 1.35 | 1.50 | 1.19 | 3.57 | 1.04 | 1.36 | 1.03 | 2.51 | 3.19 | 1.45 | 3.56 | 2.00 | 1.25 | 1.22 | 1.73 | 1.42 | 1.01 | .72 | 2.30 | 1.28 | 1.89 | 1.25 |
| Electric wiring | 1.41 | 1.18 | 1.93 | 1.25 | 1.44 | .98 | 2.56 | 1.44 | .98 | .92 | 1.89 | 3.29 | .85 | 1.95 | 2.15 | 1.09 | 1.18 | 1.84 | 1.45 | .89 | .75 | 2.53 | 1.16 | 1.32 | 1.28 |
| Excavation—earth—D | 4.29 | 2.18 | 5.88 | 2.88 | 3.10 | 3.41 | 6.95 | 1.26 | 2.78 | 1.30 | 3.81 | 7.46 | 1.45 | 6.38 | 2.77 | 1.89 | 2.41 | 2.33 | 2.86 | 2.25 | 1.20 | 5.39 | 3.35 | 3.68 | 2.52 |
| Excavation—rock—E | 4.90 | 4.13 | 6.71 | 3.91 | 6.50 | 3.27 | 11.38 | 5.57 | 4.82 | 3.17 | 7.77 | A | 2.25 | 10.81 | 7.11 | 3.54 | 4.56 | 6.19 | 4.03 | 2.78 | 2.46 | 10.49 | 4.18 | 6.42 | 3.55 |
| Glazing | 3.88 | 3.06 | 5.32 | 3.00 | 3.80 | 2.61 | 8.59 | 2.99 | 3.73 | 2.46 | 6.21 | 6.73 | 1.00 | 8.31 | 5.34 | 2.52 | 3.12 | 3.73 | 1.15 | 2.22 | 1.80 | 5.17 | 3.33 | 4.81 | 1.01 |
| Insulating | 2.14 | 1.64 | 2.93 | 1.77 | 1.75 | 1.46 | 4.23 | 1.28 | 2.12 | 1.62 | 3.46 | 5.72 | B | 4.17 | 2.47 | 1.60 | 1.22 | 1.82 | 3.09 | 1.30 | .93 | 4.04 | 1.65 | 3.00 | 2.72 |
| Lathing | 1.78 | 1.48 | 2.44 | 1.45 | 1.75 | 1.27 | 3.15 | 1.45 | 1.50 | 1.19 | 2.98 | 5.72 | .80 | 3.86 | 2.50 | 1.31 | 1.54 | 2.29 | 1.75 | 1.07 | .89 | 4.04 | 1.53 | 2.54 | 1.54 |
| Masonry | 2.06 | 1.56 | 2.82 | 2.34 | 3.00 | 1.38 | 5.70 | 1.07 | 1.60 | 1.12 | 2.44 | 5.83 | 1.10 | 3.60 | 1.66 | 1.26 | 1.01 | 3.32 | 1.92 | 1.90 | .80 | 4.48 | 1.17 | 1.80 | 1.69 |
| Painting and decorating | 3.06 | 2.73 | 4.19 | 3.14 | 3.90 | 1.83 | 6.15 | 1.31 | 1.72 | 1.92 | 3.14 | 6.67 | 1.90 | 4.06 | 4.64 | 2.14 | 1.62 | 1.99 | 1.94 | 1.71 | 1.08 | 5.13 | 1.85 | 2.50 | 1.71 |
| Pile driving—building foundations | 10.08 | 8.03 | 13.81 | 3.93 | 4.50 | 6.86 | 10.75 | 8.07 | 6.83 | 5.91 | 16.50 | 15.90 | A | 8.70 | 9.70 | 6.79 | 8.17 | 10.12 | 5.62 | 2.90 | 3.99 | 11.67 | 8.30 | 11.36 | 4.95 |
| Plastering | 2.14 | 1.64 | 2.93 | 1.77 | 1.75 | 1.46 | 4.23 | 1.28 | 1.83 | 1.62 | 3.07 | 5.72 | .80 | 4.17 | 2.47 | 1.60 | 1.22 | 1.82 | 3.09 | 1.30 | .93 | 4.04 | 1.65 | 2.02 | 2.72 |
| Plumbing | 1.51 | 1.15 | 2.07 | 1.35 | 1.60 | 1.19 | 3.65 | 1.17 | 1.40 | .98 | 1.70 | 2.91 | .80 | 1.99 | 1.64 | 1.29 | .99 | 1.77 | .95 | 1.07 | .70 | 2.24 | 1.06 | 2.21 | .84 |
| Roofing | 7.48 | 6.52 | 10.25 | 6.90 | 6.30 | 5.96 | B | 4.09 | 5.16 | 4.18 | 12.62 | 15.59 | 2.15 | 10.51 | 5.82 | 4.82 | 3.60 | 5.37 | 5.37 | 4.25 | 3.49 | B | 4.35 | 9.07 | 4.73 |
| Sheet metal work | 2.16 | 2.00 | 2.96 | 1.74 | 1.85 | 1.54 | 4.28 | 1.75 | 1.62 | 1.28 | 3.15 | 6.42 | 2.15 | 5.20 | 2.59 | 1.58 | 1.92 | 2.25 | 1.94 | 1.33 | 1.12 | 4.59 | 1.85 | 2.35 | 1.71 |
| Steel erection—door and sash | 2.43 | 2.03 | 3.33 | 1.98 | 2.80 | 1.72 | 4.57 | 1.96 | 2.49 | 1.65 | 4.13 | 3.55 | 4.35 | 5.30 | 3.10 | 1.77 | 2.08 | 3.21 | 1.73 | 1.45 | 1.20 | A | 2.15 | 3.53 | 1.52 |
| Steel erection—interior ornament | 2.56 | 2.11 | 3.51 | 2.07 | A | 1.82 | 4.93 | 2.04 | 2.62 | 1.74 | 4.37 | 5.94 | 3.00 | 5.59 | 3.50 | 1.85 | 2.20 | 3.47 | 1.73 | 1.54 | 1.26 | 4.57 | 2.21 | 3.31 | 1.52 |
| Steel erection—structural | 15.64 | 10.82 | 21.43 | 10.64 | 13.80 | 10.44 | 23.17 | 8.82 | 8.15 | 5.74 | 15.14 | 25.39 | 4.35 | 28.97 | 17.88 | 8.77 | 7.80 | 8.91 | 7.74 | 8.12 | 5.65 | 19.52 | 12.52 | 10.62 | A |
| Steel erection—dwellings—2 stories | 7.01 | 5.20 | 9.60 | 5.18 | 4.70 | 4.44 | 9.16 | 4.97 | 5.63 | 3.32 | 9.02 | 12.19 | 4.35 | 13.62 | 9.76 | 3.61 | 4.88 | 8.91 | 5.72 | 3.78 | 2.96 | 9.53 | 5.91 | 5.40 | 5.03 |
| Steel erection—general | 10.75 | 8.23 | 14.73 | 7.94 | 7.10 | 6.55 | 12.72 | 8.82 | 6.99 | 3.24 | 11.81 | A | 4.35 | 21.84 | 12.65 | 6.20 | 5.94 | 6.10 | 7.74 | 5.82 | 3.35 | 12.98 | 7.25 | 9.97 | 6.81 |
| Tile work—interior | 1.08 | .96 | 1.48 | .96 | 1.36 | .84 | 3.51 | .90 | 1.15 | .76 | 1.95 | 2.10 | .55 | 2.39 | 1.53 | .92 | 1.02 | 1.26 | 1.95 | .74 | .58 | 1.62 | .97 | 1.12 | 1.72 |
| Timekeepers and watchmen | 2.49 | 2.14 | 3.41 | 2.07 | A | 1.80 | 5.85 | 2.04 | 2.65 | 1.74 | 4.35 | 5.45 | G | 5.51 | 3.03 | 1.95 | 2.20 | G | 2.29 | 1.56 | 1.32 | 4.69 | 2.16 | 3.78 | 2.02 |
| Waterproofing—brush | 3.06 | 2.73 | 4.19 | 3.14 | 3.90 | 1.83 | 6.15 | 1.31 | 1.72 | 1.92 | 3.14 | 6.67 | 1.10 | 4.06 | 4.64 | 2.14 | 1.62 | 1.99 | 1.94 | 1.71 | 1.08 | 5.13 | 1.85 | 2.50 | 1.71 |
| Waterproofing—trowel—interior | 2.14 | 1.64 | 2.93 | 1.77 | 1.75 | 1.46 | 4.23 | 1.28 | 1.83 | 1.62 | 3.07 | 5.72 | 1.10 | 4.17 | 2.47 | 1.60 | 1.22 | 1.82 | 3.09 | 1.30 | .93 | 4.04 | 1.65 | 2.02 | 2.72 |
| Waterproofing—trowel—exterior | 2.06 | 1.56 | 2.82 | 2.34 | 3.00 | 1.38 | 5.70 | 1.07 | 1.60 | 1.12 | 2.44 | 5.83 | 1.10 | 3.60 | 1.66 | 1.26 | 1.01 | 3.32 | 1.92 | 1.90 | .80 | 4.48 | 1.17 | 1.80 | 1.69 |
| Waterproofing—pressure gun | 3.81 | 2.55 | 5.22 | 4.19 | 3.90 | 2.24 | 6.39 | 2.35 | 2.17 | 1.65 | 5.65 | 6.69 | 1.10 | 6.47 | 3.80 | 2.17 | 2.39 | 3.32 | 3.11 | 1.99 | 1.43 | 5.15 | A | 2.69 | 2.74 |
| Wrecking | 15.53 | 12.31 | 21.28 | 11.91 | 15.40 | 10.84 | B | 9.70 | 10.63 | 6.51 | 20.24 | 32.43 | 9.00 | 28.36 | 20.60 | 10.28 | 10.42 | 14.84 | 21.59 | 8.91 | 6.03 | 24.93 | A | 15.42 | 19.00 |

*A Specially rated—refer to company. *B Rate varies with type of work. *C Includes form work. *D Pile driving, caisson and coffer dam work separately rated. *E Special occupational disease loadings apply. *F Outside work only—Inside work $2.13. *G Assigned to main classification. *H Advisory only, subscription to State Fund mandatory—Nevada, Industrial Comm., Carson City, Nev., Workman's Compensation Bu., Bismarck, N. Dak., The Industrial Commission of Ohio, Columbus, Ohio, State Compensation Comm., Charleston, W. Va., Workmen's Compensation Dept., State Treasurer's Office, Cheyenne, Wyo.

## Cost to own construction equipment as % of price

Fixed expense per working month just to own construction equipment is expressed in per cent of cost new by the Assoc. Gen'l. Contractors of Amer. in 1949 AGC Manual, Contractors' Equipment Ownership Expense.

This does not cover cost of field repairs, fuel lubricants or other operating cost. It is not a rental schedule.

It does cover depreciation (D in table below), overhauling, major repairs, painting (OR), interest, taxes, storage, insurance (IT), total ownership expense (Tot), average use in months per year (U) and expense per working month (E/mo).

A few examples follow, from more than 2500 in this 78-page manual:

| Average annual Ownership Expense | D % | OR % | IT % | Tot % | U/ mo | E/ % |
|---|---|---|---|---|---|---|
| | % of captl investmnt | | | | | |
| **Air comp., port,** | | | | | | |
| gas, 60 cf | 25 | 15 | 11 | 51 | 6 | 8.5 |
| gas & Diesel 105 cf | 25 | 15 | 11 | 51 | 6 | 8.5 |
| gas & Diesel 210 cf | 20 | 15 | 11 | 46 | 6 | 7.7 |
| stat., elect 46 cf | 25 | 15 | 11 | 51 | 6 | 8.5 |
| 215 cf | 20 | 15 | 11 | 51 | 6 | 7.7 |
| **Air tools, drifter** | 25 | 10 | 11 | 46 | 6 | 7.7 |
| rock drill | 33 | 10 | 11 | 54 | 6 | 9.0 |
| hose air ½" | 50 | 10 | 11 | 71 | 8 | 8.9 |
| receiver | 10 | 10 | 11 | 31 | 6 | 5.2 |
| sharpener, forge | 17 | 10 | 11 | 37 | 6 | 6.3 |
| **Batcher equip** | 25 | 17 | 11 | 53 | 6 | 8.8 |
| bins, steel-port | 20 | 15 | 11 | 46 | 6 | 7.7 |
| bins, stl-knockdn | 17 | 15 | 11 | 43 | 6 | 7.2 |
| **Cement plant, bulk** | 20 | 15 | 11 | 46 | 6 | 7.7 |
| **Cranes, Crawler** | | | | | | |
| Dies. 4-T 10' R | 25 | 10 | 11 | 46 | 8 | 5.8 |
| 6-T 10' R | 20 | 10 | 11 | 41 | 8 | 5.1 |
| 20-T 12' R | 13 | 10 | 11 | 34 | 7 | 4.9 |
| Gas 6-T 10' R | 25 | 10 | 11 | 46 | 8 | 5.7 |
| 18-T 12' R | 13 | 10 | 11 | 34 | 7 | 4.9 |
| Truck, Dies or Gas | | | | | | |
| 4-T 10' R | 25 | 15 | 11 | 51 | 8 | 6.4 |
| 8-T 10' R | 20 | 15 | 11 | 46 | 8 | 5.8 |
| 15-T 10' R | 17 | 10 | 11 | 38 | 7 | 5.4 |
| **Crusher, Cone or Gyr** | 10 | 12 | 11 | 33 | 6 | 5.5 |
| **Crusher, Jaw** | 17 | 12 | 11 | 40 | 6 | 6.7 |
| **Dragline, Crawler** | | | | | | |
| Dies. ¾ cy 35' bm | 25 | 15 | 11 | 51 | 9 | 5.7 |
| 4 cy 75' bm | 15 | 15 | 11 | 41 | 7 | 5.9 |
| Elect ¾ cy 35' bm | 20 | 12 | 11 | 43 | 9 | 4.6 |
| 3 cy 60' bm | 10 | 12 | 11 | 33 | 7 | 4.7 |
| Gas ¾ cy 35' bm | 25 | 15 | 11 | 51 | 9 | 5.7 |
| 1½ cy 50' bm | 17 | 15 | 11 | 43 | 7 | 6.1 |
| **Engine,** | | | | | | |
| Dies. & Clutch 10 hp | 15 | 15 | 11 | 41 | 7 | 5.9 |
| 30 hp | 12 | 12 | 11 | 35 | 7 | 5.0 |
| 165 hp | 10 | 12 | 11 | 33 | 7 | 4.7 |
| Gas 10 hp | 20 | 15 | 11 | 46 | 7 | 6.6 |
| 45 hp | 12 | 12 | 11 | 35 | 7 | 5.0 |
| **Grader, self propel** | 20 | 15 | 11 | 46 | 8 | 5.8 |
| **Hoist, gas doub.-drum** | 17 | 10 | 11 | 38 | 8 | 4.8 |
| **Hose** | 50 | 10 | 11 | 71 | 7 | 10.1 |
| **Mixer, concrete,** | | | | | | |
| Gas 3½-S | 50 | 12 | 11 | 73 | 8 | 9.1 |
| 14-S | 33 | 12 | 11 | 56 | 8 | 7.0 |
| (skids) 28-S | 25 | 12 | 11 | 48 | 8 | 6.0 |
| elect 3½-S | 30 | 12 | 11 | 56 | 8 | 7.0 |
| 10-S | 20 | 12 | 11 | 43 | 8 | 5.4 |
| **Mixer, truck,** | | | | | | |
| body & eng 1 cy | 33 | 12 | 11 | 56 | 8 | 7.0 |
| 2 cy | 25 | 12 | 11 | 48 | 8 | 6.0 |
| incl truck 1 cy | 33 | 16 | 11 | 60 | 8 | 7.5 |
| 2 cy | 25 | 16 | 11 | 52 | 8 | 6.5 |
| **Motor, elect 10 hp** | 10 | 10 | 11 | 31 | 7 | 4.4 |
| 200 hp | 10 | 10 | 11 | 31 | 6 | 5.2 |
| **Pump, portable** | | | | | | |
| centr gas | 20 | 18 | 11 | 49 | 6 | 8.2 |
| elect | 17 | 15 | 11 | 43 | 6 | 7.2 |
| diaphr gas | 20 | 20 | 11 | 51 | 6 | 8.5 |
| elect | 17 | 15 | 11 | 43 | 6 | 7.2 |
| **Rope, wire, ½"** | 40 | 20 | 11 | 71 | 8 | 8.9 |
| manila ½" | 50 | 20 | 11 | 81 | 7 | 11.6 |
| **Saw, chain** | 33 | 15 | 11 | 59 | 8 | 7.4 |
| **Saw, elect hand** | 33 | 10 | 11 | 54 | 8 | 6.8 |
| **Scraper, self loading** | 20 | 15 | 11 | 46 | 8 | 5.8 |
| **Shovel, Crawler** | | | | | | |
| Diesel ¾ cy | 25 | 15 | 11 | 51 | 9 | 5.7 |
| 3½ cy | 14 | 15 | 11 | 40 | 7½ | 5.3 |
| Elect ¾ cy | 20 | 12 | 11 | 43 | 9 | 4.6 |
| 2½ cy | 10 | 12 | 11 | 33 | 8 | 4.1 |
| Gas ¾ cy | 25 | 15 | 11 | 51 | 9 | 5.7 |
| 1½ cy | 17 | 15 | 11 | 43 | 8 | 5.4 |
| **Tractor, Crawler** | | | | | | |
| Dies. 20–33 hp | 25 | 15 | 11 | 51 | 9 | 5.7 |
| 52–62 hp | 20 | 15 | 11 | 46 | 8 | 5.8 |
| Gas 20–33 hp | 33 | 15 | 11 | 59 | 9 | 6.6 |
| 66–85 hp | 20 | 15 | 11 | 46 | 8 | 5.8 |
| 2-wh, rubber tired | 20 | 15 | 11 | 46 | 8 | 5.8 |

## Construction equipment rental rates

EQUIPMENT RENTAL RATES vary greatly throughout the United States, depending upon local practices and conditions. A compilation of prevailing rental rates (representing as nearly as could be determined an over-all average of rental rates throughout the United States for specified types of equipment) has been made for informational purposes only by the Associated Equipment Distributors, 360 N. Michigan Ave., Chicago, Ill., and is available at $3 per copy. Selected items from the Fifth Edition published in 1950 are reported below:

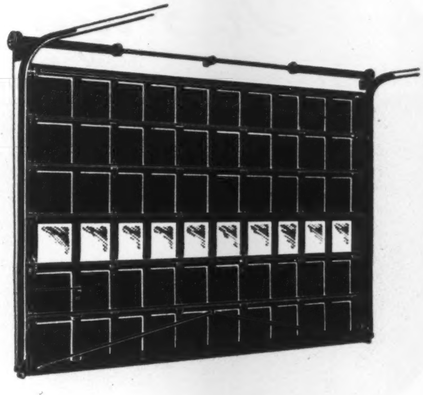
| Type of equipment | Per month | Per week | Per day |
|---|---|---|---|
| **Air compressors** | | | |
| Port gas 105–160 cf. 100 psi | $212.00 | $70.75 | $22.50 |
| Port gas 160–210 cf. 100 psi | 290.00 | 95.75 | 31.00 |
| Port, diesel 160–210 cf. 100 psi | 340.00 | 113.00 | 37.00 |
| Port, diesel 425–500 cf. 100 psi | 688.00 | 225.00 | 73.25 |
| Stat, elec 160–215 cf. 100 psi | 173.00 | 57.75 | 19.50 |
| 470–570 cf. 100 psi | 322.00 | 107.00 | 36.75 |
| 900–1200 cf. low pres | 415.00 | 138.00 | 46.75 |
| **Air Tools** | | | |
| Clay spades, small | 24.00 | 9.00 | 3.00 |
| Drifters | 73.50 | 24.50 | 8.25 |
| Hoists to 1500-lb. single-dr | 58.00 | 19.75 | 6.45 |
| Hoists, 1500–2500 lb. dbl-dr | 93.25 | 31.00 | 10.00 |
| Hose, over ⅝ in. to 1 in., 50-ft. length | 7.05 | 3.40 | 1.60 |
| Paving breakers 70–90 lb | 42.25 | 14.75 | 4.75 |
| Rivet hammers | 29.75 | 10.50 | 3.60 |
| Vibrators, pneu pwr, (rigid) | 68.75 | 23.00 | 8.15 |
| Wagon drill (with air hoist) | 189.00 | 62.25 | 20.50 |
| Hammers, gasoline | 85.25 | 28.50 | 9.15 |
| **Boilers** | | | |
| Vertical 18–24 hp | 91.00 | 30.25 | 10.25 |
| Vertical 32–55 hp | 118.00 | 37.50 | 12.50 |
| Horizontal 55–70 hp | 137.00 | 42.75 | 14.50 |
| Horizontal 90–125 hp | 208.00 | 68.25 | 22.00 |
| **Buckets** | | | |
| Clamshell ⅜ cu. yd | 78.50 | 26.25 | 8.60 |
| Clamshell ¾ cu. yd | 111.00 | 37.50 | 12.25 |
| Clamshell 1½ cu. yd | 165.00 | 56.00 | 18.25 |
| Concr bottom-dump 1 cu. yd | 45.50 | 15.00 | 5.15 |
| Concr bottom-dump 2 cu. yd | 61.25 | 21.00 | 7.25 |
| Dragline 1 cu. yd | 100.00 | 34.25 | 11.50 |
| Dragline 1½ cu. yd | 125.00 | 40.75 | 13.75 |
| Dragline 2 cu. yd | 147.00 | 48.75 | 16.25 |
| Orangepeel 1¼ cu. yd | 204.00 | 68.00 | 22.75 |
| **Bulldozers — see tractors** | | | |
| **Concr carts 6 cf. rub tired** | 16.50 | 5.30 | 2.00 |
| 9–11 cu. ft. rubber tired | 19.50 | 7.00 | 2.45 |
| **Cranes (capacity at ft. radius)** | | | |
| Crawl gas 4¾–7⅜ ton 12 | 553.00 | 184.00 | 61.25 |
| 14½–19½ ton 12 | 825.00 | 277.00 | 90.25 |
| 18½–26 ton 20 | 1,725.00 | 555.00 | 181.00 |
| Crawl diesel 14½–19½ ton 12 | 965.00 | 317.00 | 104.00 |
| 18½–26 ton 20 | 2,070.00 | 665.00 | 220.00 |
| 14½–20 ton 45 | 3,225.00 | 1,075.00 | 356.00 |
| Crawl steam 18½–24½ ton 12 | 855.00 | 285.00 | 97.00 |
| Locomotive gas 27–32 ton 12 | 1,485.00 | 495.00 | 166.00 |
| Locomotive st 27–32 ton 12 | 1,400.00 | 467.00 | 156.00 |
| Truck-mounted gas 7–9 ton 10 | 880.00 | 274.00 | 86.00 |
| 12–14½ ton 10 | 1,160.00 | 385.00 | 118.00 |
| **Crushers (without accessories or power)** | | | |
| Openings 9x16 | 105.00 | 35.50 | 11.75 |
| Openings 10x30 | 231.00 | 77.50 | 25.25 |
| Openings 12x36 | 320.00 | 108.00 | 35.00 |
| **Derricks, stiff-leg** | | | |
| Wood 3½–4½ ton | 117.00 | 39.50 | 13.00 |
| Steel 4–6 ton 50–80' boom | 257.00 | 84.50 | 28.25 |
| 13–17 ton 70–100' boom | 463.00 | 151.00 | 50.75 |
| 32–42 ton 70–100' boom | 655.00 | 214.00 | 71.50 |
| Guy 13–17 ton 70–110' boom | 282.00 | 92.75 | 31.25 |
| Guy 35–45 ton 100–120' boom | 533.00 | 175.00 | 58.25 |
| **Engines** | | | |
| Gas with clutch 22–30 hp | 59.25 | 19.75 | 6.60 |
| Gas with clutch 55–70 hp | 109.00 | 36.25 | 12.10 |
| Diesel with clutch 22–30 hp | 89.75 | 29.50 | 9.95 |
| Diesel with clutch 55–70 hp | 161.00 | 53.75 | 17.75 |
| Diesel with clutch 90–115 hp | 295.00 | 98.50 | 32.25 |
| **Finegraders 11–16' width (self-powered)** | 760.00 | 250.00 | 83.50 |
| **Finishing machine** | | | |
| Concrete-floor (powered) | 75.00 | 25.50 | 8.55 |
| Road finishers 12–18' rdwy | 510.00 | 169.00 | 58.50 |
| Road finishers 24–30' rdwy | 570.00 | 189.00 | 65.50 |
| Bituminous machines | 865.00 | 288.00 | 95.75 |
| **Graders** | | | |
| Single drive—8,600 to 14,000 lb. gas | 318.00 | 106.00 | 34.75 |
| Tand dr. 19,000–21,000 lb. gas | 560.00 | 182.00 | 61.00 |
| Tand. dr 18,501–21,500 lb. dsl | 640.00 | 207.00 | 69.00 |
| Towed-power operated 9–11' | 221.00 | 74.50 | 25.25 |
| **Pile hammers** | | | |
| Drop 1,500–2,250 lb | 25.25 | 8.80 | 2.85 |
| McKiernan-Terry #2 | 68.75 | 23.50 | 8.05 |
| McKiernan-Terry #7 | 162.00 | 54.90 | 18.25 |
| McKiernan-Terry #10B2 or 3 | 314.00 | 102.00 | 34.50 |
| Vulcan #1 | 317.00 | 104.00 | 34.25 |
| Vulcan #00 | 456.00 | 153.00 | 51.00 |
| Vulcan Pile Hammer #1800 | 264.00 | 88.50 | 29.50 |
| **Tank Car Heater 2–3 car capacity** | 260.00 | 86.25 | 29.50 |
| **Hoists** | | | |
| Gas. single-drum 29–42 hp | 114.00 | 38.50 | 12.50 |
| Gas. double-drum 22–28 hp | 119.00 | 39.75 | 13.00 |
| Gas double-drum 55–65 hp | 202.00 | 67.50 | 22.50 |
| Elec single-drum 17–27 hp | 85.00 | 28.00 | 9.35 |
| Elec double-drum 37–47 hp | 159.00 | 52.50 | 17.75 |
| Air 1,500–2,500 lb. doub dr | 93.25 | 31.00 | 10.00 |
| Chain 1½–2½ ton | 22.50 | 8.10 | 2.95 |
| Chain 4–6½ ton | 36.00 | 12.25 | 4.30 |
| **Mixers, Bituminous** | | | |
| Central plant 30–50 ton/hr. (gradation control) | 1,830.00 | 610.00 | 204.00 |
| Central plant 70–90 ton per hr. (gradation control) | 2,655.00 | 895.00 | 297.00 |
| Travelg plant 1¼–1¾ cy/min. (self-propelling) | 1,260.00 | 428.00 | 144.00 |
| **Mixers, concrete** | | | |
| Power charger 6S to 8½S | 102.00 | 35.25 | 11.75 |
| Power charger 12S to 16S | 193.00 | 64.50 | 21.75 |
| *Batch hopper 25S to 30S | 255.00 | 84.50 | 28.00 |
| Paver 27-E, 1- and 2-drum | 1,030.00 | 338.00 | 116.00 |
| Paver 34-E, single drum | 1,515.00 | 496.00 | 164.00 |
| **Pumpcrete (concr pump) gas** | | | |
| Mod 160 single cyl (no remix) | 545.00 | 182.00 | 61.00 |
| Mod 200 doub cyl (with remix) | 1,520.00 | 505.00 | 168.00 |
| **Pumps** | | | |
| Centrifugal, gas, 2" 7 to 10 M | 48.00 | 16.25 | 5.15 |
| 4" 30 to 40 M | 94.25 | 31.25 | 10.25 |
| 8" 125M | 232.00 | 76.25 | 25.50 |
| Diaph force or open 3" doub | 58.50 | 20.25 | 6.75 |
| Diaph force or open 4" doub | 70.75 | 24.75 | 8.30 |
| **Rollers** | | | |
| 2-wheel tand 5–9½ ton gas | 297.00 | 100.00 | 32.75 |
| 2-wheel tand 12½–17½ ton gas | 385.00 | 130.00 | 43.00 |
| 3-wheel 5½–6½ ton gas | 241.00 | 81.25 | 28.50 |
| 3-wheel 7½–9 ton gas | 313.00 | 106.00 | 35.00 |
| 3-wheel 11–13 ton gas | 485.00 | 164.00 | 54.50 |
| Sheepsfoot, double drum | 111.00 | 35.75 | 12.00 |
| Sheepsfoot, triple drum | 203.00 | 67.25 | 22.75 |
| **Shovels & back-hoes (dipper incl)** | | | |
| Crawler, gas ⅜ cu. yd | 535.00 | 177.00 | 58.75 |
| Crawler, gas ¾ cu. yd | 795.00 | 263.00 | 84.50 |
| Crawler, gas 1¼ cu. yd | 1,050.00 | 352.00 | 118.00 |
| Crawler, diesel ¾ cu. yd | 915.00 | 297.00 | 96.00 |
| Crawler, diesel 1¼ cu. yd | 1,345.00 | 447.00 | 150.00 |
| Crawler, diesel 2 cu. yd | 2,395.00 | 765.00 | 255.00 |
| **Surveying instruments** | | | |
| Levels | 23.95 | 8.35 | 3.15 |
| Transits | 29.00 | 10.50 | 3.65 |
| **Tractor, crawler, & attachments** | | | |
| 33–41 hp. gasoline | 318.00 | 103.00 | 34.20 |
| 66–85 hp. gasoline | 507.00 | 170.00 | 56.75 |
| 46–52 hp. diesel | 479.00 | 160.00 | 53.75 |
| 72–89 hp. diesel | 755.00 | 251.00 | 82.00 |
| 89–135 hp. diesel | 920.00 | 303.00 | 98.50 |
| Winch, any size, doub drum | 94.25 | 30.50 | 10.40 |
| Bulldozer 66–89 hp. tractor | 148.00 | 49.25 | 15.75 |
| Angledozer 66–89 hp. tractor | 179.00 | 60.00 | 20.25 |
| **Tractors-wheeled** | | | |
| 4-wh, rub tired dsl 93–103 hp | 617.00 | 206.00 | 68.70 |
| 4-wh, rub tired dsl 140–160 hp | 989.00 | 330.00 | 110.00 |
| 2-wh, rub tired dsl 145–160 hp | 1,510.00 | 504.00 | 168.00 |
| 2-wh, rub tired dsl 195–210 hp | 1,962.00 | 654.00 | 218.00 |
| **Scrapers & Wagons (heaped meas)** | | | |
| Scraper 7–10 cu. yd | 300.00 | 98.75 | 32.50 |
| Scraper 17–22 cu. yd | 675.00 | 222.00 | 73.25 |
| Scraper 29–37 cu. yd | 1,207.00 | 395.00 | 132.00 |
| Crawl wgns, bot dmp | | | |
| 9½–12½ cy | 276.00 | 92.00 | 31.00 |
| 14½–20½ cy | 428.00 | 143.00 | 48.00 |
| **Vibrators, gas, flexible shaft** | | | |
| Up to 1½ hp. 28 ft. shafting | 49.75 | 17.00 | 5.50 |
| 3½–4½ hp. 46 ft. shafting | 82.75 | 27.50 | 8.90 |
| **Welding Mach, wheels or skids** | | | |
| Gas-eng driven up to 250 amp | 84.00 | 28.25 | 9.25 |
| Gas-eng driven 350 to 500 amp | 134.00 | 45.00 | 15.25 |
| 60 cycle mot dr up to 250 amp | 43.50 | 15.00 | 5.10 |
| 60 cycle mot dr 350 to 500 amp | 65.00 | 22.25 | 7.50 |

## Construction equipment cost index

**By Marshall & Stevens, Chicago, 1926 = 100**

Construction machines were 74% higher in cost in Dec. 1950 than in 1942 or in 1926 according to the M&S construction equipment cost index The big increases came in 1946 and 1947, then began again in 1950.

| | | | | | |
|---|---|---|---|---|---|
| 1913 | 63.0 | 1926 | 100.0 | 1939 | 82.4 |
| 1914 | 59.2 | 1927 | 95.9 | 1940 | 83.4 |
| 1915 | 61.2 | 1928 | 96.8 | 1941 | 92.0 |
| 1916 | 67.5 | 1929 | 91.0 | 1942 | 100.8 |
| 1917 | 88.2 | 1930 | 86.1 | 1943 | 101.3 |
| 1918 | 122.6 | 1931 | 77.6 | 1944 | 101.6 |
| 1919 | 129.0 | 1932 | 71.9 | 1945 | 102.5 |
| 1920 | 154.4 | 1933 | 71.8 | 1946 | 124.2 |
| 1921 | 119.7 | 1934 | 76.0 | 1947 | 150.3 |
| 1922 | 83.5 | 1935 | 79.7 | 1948 | 161.1 |
| 1923 | 97.3 | 1936 | 83.0 | 1949 | 161.1 |
| 1924 | 107.2 | 1937 | 87.2 | 1950 | 166.2 |
| 1925 | 105.4 | 1938 | 82.9 | 12/50 | 174.1 |



## *Why has our door been chosen*

## *Standard of the Industry?*

*Here's The Most Imitated Door in America—*
*The Crawford Marvel-Lift Door*

In coming months you'll see the mechanical features of the Crawford Marvel-Lift Door increasingly emphasized by other manufacturers in their new models.

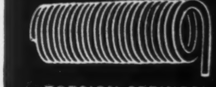
These copied features will be described as "important improvements"—which they are. We know, because they've been *Standard Equipment* on Crawford Marvel-Lift Doors for anywhere up to 17 years—and they are the very heart of nearly a million successful Marvel-Lift installations. They have advantages offered in no other mechanism.

That's why others are frankly copying them. And, that's why the Crawford Marvel-Lift Door has become the acknowledged *Standard of the Industry.*

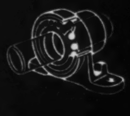
Write on your letterhead for free copy of the Crawford 60-Second Door Selector. It's packed with helpful information about doors, large and small, all indexed for instant finding.

**CRAWFORD DOOR COMPANY**
Main Plant: 67-401 St. Jean Ave., Detroit 14, Michigan

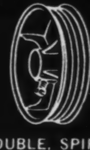
FABRICATING PLANTS in Portland • Tacoma • Los Angeles • San Francisco • Dallas
Kansas City • Chattanooga • Milwaukee • Hudson • Cadillac • Ottawa, Canada.
DISTRIBUTING WAREHOUSES in 79 major cities.
SALES AND SERVICE companies everywhere.



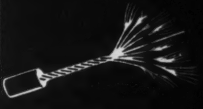
TORSION SPRINGS
on
FULL-WIDTH SHAFT
Standard since
1934



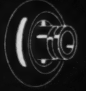
BALL BEARING
SHAFT BRACKETS
Standard since
1937



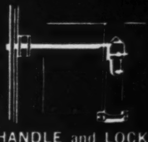
DOUBLE, SPIRAL
GROOVED CABLE
DRUMS
Standard since
1935



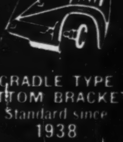
56-STRAND, SILENT
AERO-TYPE
CABLES
Standard since
1935



CASE-HARDENED
10-BALL BEARING
ROLLERS
Standard since
1938



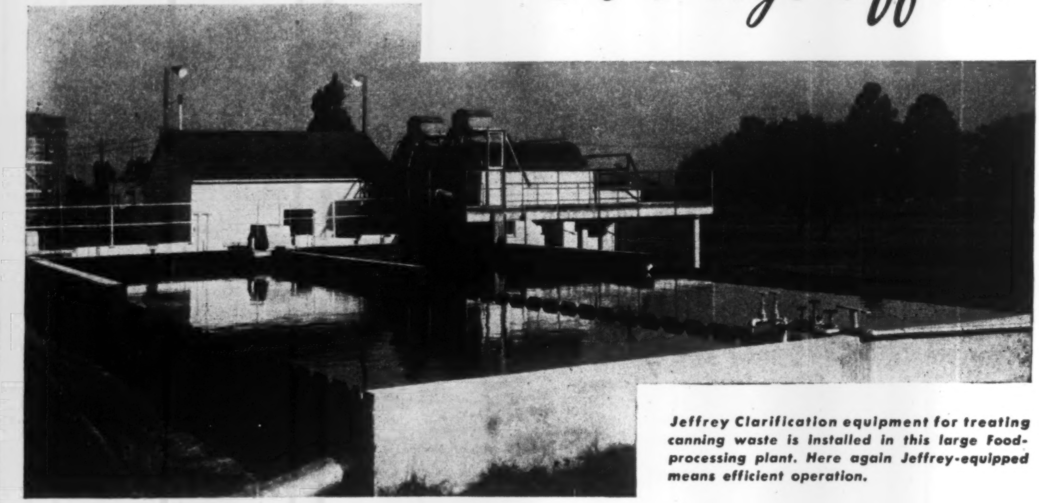
HANDLE and LOCK
on SIDE for
convenience
Standard since
1935



CRADLE TYPE
BOTTOM BRACKETS
Standard since
1938

# *TREAT* **INDUSTRIAL WASTE** *RIGHT*

## *It Pays Off...*



*Jeffrey Clarification equipment for treating canning waste is installed in this large Food-processing plant. Here again Jeffrey-equipped means efficient operation.*

**Industrial Waste is the Peck's Bad Boy in nearly every plant . . always in bad with the neighbors as well as State Pollution Control Commissions.**

**Clarification of industrial waste need not be such a bad problem. Jeffrey has the facilities for proper and efficient waste treatment . . can help you keep the nation's waters clean. For meeting exacting specifications we can furnish Collector mechanisms for Grit Chambers and Settling Basins, Screens, grease and oil Skimmers, Flocculation equipment, etc., backed by years of experience in designing and building the best in Sewage and Water treatment equipment.**

**We will be glad to send you some of the names of outstanding plants in which Jeffrey equipment is doing a real job on the purification of sewage and concentrated organic wastes . . and paying off. May we hear from you?**

Bar and Disc-type Screens
Sludge Collectors
Sludge Elevators
Grit Washers and Collectors

FLOCTROLS (controlled flocculation)
Equipment for Biofiltration plants
Transmission Machinery
Scum Removers
Garbage Grinders

Chemical Feeders
Screenings Grinders
Belt and Spiral Conveyors
Chains and Sprockets

**THE JEFFREY**
**MANUFACTURING COMPANY** Established 1877
923 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

Baltimore 2
Beckley, W. Va.
Birmingham 3

Boston 16
Buffalo 2
Chicago 1

Cincinnati 2
Cleveland 15
Denver 2

Detroit 13
Harlan, Ky.
Houston 2

Jacksonville 2
Milwaukee 2
New York 7

Philadelphia 3
Pittsburgh 22
St. Louis 1

Salt Lake City 1
Scranton 3

*Jeffrey Mfg. Co. Ltd., Montreal, Canada*
*Jeffrey-Galion (Pty.) Ltd., Johannesburg, S.A.*
*The Ohio Malleable Iron Co., Columbus, Ohio*

*British Jeffrey-Diamond Ltd., Wakefield, England*
*The Galion Iron Works & Mfg. C., Galion, Ohio*
*The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio*

# Depreciation Schedule—

## U. S. Bureau of Internal Revenue—Schedule "F", 1942

In January 1942 the U. S. Bureau of Internal Revenue revised its 1931 schedule of probable useful life and depreciation rates. These rates are still in effect. Items of direct interest to civil engineers are shown in revised Schedule "F", and include those quoted in the following lists.

This schedule gives the "probable useful life" of buildings and equipment in years. Depreciation rates are calculated from the years of useful life on a straight-line basis. If, for example, the probable life is 10 years, the equipment may be depreciated at the rate of 10% a year. If 25 years, the rate is 4%.

### BUILDINGS

| | Bldg. Only | Bldg. & Equip. | | |
|---|---|---|---|---|
| | Est. Life | Composite rate (per cent) Type of construction | | |
| | Years | Good | Average | Cheap |
| Apartments | 50 | 2½ | 2½ | 3 |
| Banks | 67 | 2 | 2 | 2½ |
| Dwellings | 60 | 2 | 2½ | 3 |
| Factories | 50 | 2½ | 2½ | 3 |
| Farm bldgs | 60 | 2 | 2 | 2½ |
| Garages | 60 | 2 | 2½ | 3 |
| Grain elvtrs | 75 | 1½ | 2 | 2½ |
| Hotels | 50 | 2½ | 2½ | 3 |
| Loft bldgs | 67 | 2 | 2 | 3 |
| Mach. shops | 60 | 2 | 2½ | 3 |
| Office bldgs | 67 | 2 | 2½ | 3 |
| Stores | 67 | 2 | 2 | 2½ |
| Theaters | 50 | 2¾ | 3 | 3¾ |
| Warehouses | 75 | 1½ | 2 | 2½ |

### BUILDING EQUIPMENT

| | Years |
|---|---|
| Air conditioning syst: | |
| Over 20 tons | 20 |
| 5 to 15 tons | 15 |
| Under 5 tons | 10 |
| Air washer. (See dehumidifier.) | |
| Compressors: | |
| Refrigerating | 20 |
| Air for pneu. controls | 20 |
| Condensers: | |
| Shell and tube | 20 |
| Double pipe | 20 |
| Evaporation | 15 |
| Coolers, water—tank & coil or shell & tube | 20 |
| Dehumidifier | 10 |
| Drums, purge or surge | 20 |
| Ducts and other sheet metal work | • |
| Fans | 15 |
| Filters, air, oil, self-cleaning | 20 |
| Dry cleanable | 10 |
| Gauges | 15 |
| Grilles and registers: | |
| Anemostats | 20 |
| Grilles & registers: | |
| Wall type | 20 |
| Ceiling | 20 |
| Window units | 15 |
| Placques | 20 |
| Santrols | • |
| Heaters—boiler | |
| Oil burner & tank | 20 |
| Booster heaters | 20 |
| Electric heaters | 15 |
| Finned tube, steam water cleanable tube | 20 |
| Prehtrs. and rehtrs. | 20 |
| Water heaters, open or closed type | 20 |
| Insulation—Cork, cold pipes & tanks | 20 |
| Magnesia, hot pipes | 15 |
| Wool felt | 20 |
| Asbestos | 15 |
| Louvres & screens: | |
| Copper | 25 |
| Steel | 15 |
| Manometers | 15 |
| Motors: | |
| Synchr. & exciter set | 20 |
| Induc., indoor | 20 |
| Induc., weatherproof for outdoor | 20 |
| Piping, refrig & other | 20 |
| Pumps: | |
| Chilled water | 20 |
| Condenser water | 20 |
| Condensate | 20 |
| Dehumidifiers | 22 |
| Evap. condenser | 15 |
| Sump | 25 |
| Well | 25 |
| Receivers, refrigerant | 25 |
| Regulators, suction or static pressure | 5 |
| Silica gel beds | 15 |
| Spray pond | 15 |
| Switchbd, elec. panel | 20 |
| Thermometers, room type or recording | 15 |
| Tower, cooling | 15 |
| Valves: Relief | 20 |
| Automatic expansion and by-pass | 5 |
| Solenoid | 15 |
| Water regulating | 20 |
| Ammeters | 15 |
| Clocks | 15 |
| Clocks, watchman | 15 |
| Compressors, air & vacuum | 20 |
| Electric clock systems: | |
| Clocks, time | 20 |
| Conduits, fittings & wiring. (See light. sys.) | |
| Motors & gener | 20 |
| Switch equipment: | |
| Boxes | • |
| Switch parts | 20 |
| Elevators: | |
| Freight | 25 |
| Passenger | 20 |
| Fire equipment: | |
| Fire alarm systems | 25 |
| Movable equipment | 20 |
| Sprinkler system | • |
| Guards, machine | 25 |
| Heaters, electric | 10 |
| Heaters, gas | 15 |
| Heating systems: | |
| Boilers & furnaces | 20 |
| Burner equipment— | |
| Gas | 16 |
| Oil | 10 |
| Radiators | 25 |
| Lighting systems: | |
| Conduits and fittings | • |
| Wiring | 20 |
| Fixtures | 15 |
| Miscellaneous facilities: | |
| Awnings | 5 |
| Doors, louvre, vent | 15 |
| Incinerators | 14 |
| Safes and vaults | • |
| Screens, window | 10 |
| Shades | 5 |
| Venetian blinds | 8 |
| Plumbing: | |
| Faucets & flush valves | 15 |
| Bath tubs, lavatories, toilet bowls, etc | 25 |
| Pipes— | |
| Brass or copper | • |
| Iron, cold-water | 25 |
| Iron, hot-water or steam | 20 |
| Sewer, CI. or vitr. | • |
| Valves— | |
| Brass body, water or steam | • |
| Iron body, water or steam | 20 |
| Pumps: Suct., pres. & sump | 13 |
| Roofs: | |
| Asbestos | 25 |
| Asphalt and tar (prepared) | 15 |
| Galvanized iron— | |
| Light or cold dipped | 15 |
| Heavy or hot dipped | 20 |
| Tar & grav. (5-ply) | 20 |
| Tarred felt | 10 |
| Copper, slate, tile, tin | • |
| Starters, electric | 20 |
| Switchboards, elect | 25 |
| Tanks and vats, water: | |
| Metal | 25 |
| Wood | 15 |
| Telephone equipment: | |
| Conduits and fitting | • |
| Wiring & fixtures | 20 |
| Tools, small, misc. | 5 |
| Transformers | 25 |
| Trucks, conveyance (within building) | 10 |
| Trucks, lift | 15 |
| Voltmeters | 15 |
| Welfare equip.: | |
| Athletic | 10 |
| Cafeteria | 10 |
| Hospital & first aid | 10 |
| Police and fire | 10 |
| Wells & well pumps | 25 |

• Life of building

### WATER SUPPLY

| | |
|---|---|
| Impounding dams | 150 |
| Springs and wells | 100 |
| Infilt. galleries & tunnels | 100 |
| Collection conduits and reservoirs | 75 |
| Mains, cast iron: | |
| 4-inch and less | 50 |
| 6-inch | 65 |
| 8 to 10-inch | 75 |
| 12-inch and over | 100 |
| Settling basins | 50 |
| Coagulating basins | 50 |
| Filters | 50 |
| Steam engines | 30 |
| Diesel type engines | 25 |
| Pumps | 50 |
| Stand pipes | 50 |
| Meters | 30 |
| Hydrants | 50 |
| General office equip. | 19 |
| General shop equip | 20 |
| General store equip | 20 |
| Laboratory equip | 16 |

### ARTIFICIAL GAS

| Production Plant | Years |
|---|---|
| Struct. and impvts. | 50 |
| Boiler plant equip | 30 |
| Other power equip | 40 |
| Benches and retorts | 35 |
| Coke ovens | 35 |
| Producer gas equip | 33 |
| Water gas gener. equip. | 33 |
| Petroleum gas equip | 33 |
| Other gas gener equip | 33 |
| Coal, coke, and ash handling equipment | 40 |
| Gas reforming equip | 33 |
| Purification equip | 33 |
| Residual refin. equip | 40 |
| Other prod. equip | 33 |

| Distribution Plant | |
|---|---|
| Struct. and impvts. | 45 |
| Mains | 80 |
| Cast iron pipe— | |
| 4 in. and less | 50 |
| 6 in. | 65 |
| 8 to 10 in. | 75 |
| 12 in. and over | 100 |
| Steel pipe— | |
| 4 in. and less | 30 |
| 5 to 7 in. | 40 |
| 8 in. and over | 50 |
| Wrought iron pipe— | |
| ¾ in. to 1½ in. | 33 |
| 2 to 2½ in. | 40 |
| 3 to 6 in. | 50 |
| 8 to 10 in. | 75 |
| 12 in. & over | 100 |
| Pump. & regulat. equip. | 35 |
| Services | 40 |
| Meters | 35 |
| Meter installations | 40 |
| House regulators | 40 |
| House regul. instal. | 40 |
| Other property on customers' premises | 33 |
| Other distrib. sys. equip. | 35 |

### BRIDGES

| | |
|---|---|
| Conc. & steel or masonry, large | 100 |
| small | 75 |
| Steel, heavy | 50 |
| Steel, light | 40 |

### ELECTRIC UTILITIES

| Steam Production | Years |
|---|---|
| Struct. and impvts. | 50 |
| Boiler plant equip | 28 |
| Engines and engine driven generators | 30 |
| Turbo-generators units | 30 |
| Acces. elect. equip | 28 |
| Misc. pwr plant equip. | 28 |

| Hydraulic Production | |
|---|---|
| Struct. and impvts. | 75 |
| Reservoirs, dams and waterways | 150 |
| Waterwheels, turbines and generators | 35 |
| Acces. elect. equip | 35 |
| Misc. power plant equip. | 35 |
| Roads, railroads and bridges | 100 |

| Transmission Plant | |
|---|---|
| Struct. and impvts. | 45 |
| Station equipment | 28 |
| Towers and fixtures | 50 |
| Poles and fixtures | 33 |
| Overhead conductors and devices | 50 |
| Underground conduit | 75 |
| Underground conductors and devices | 40 |
| Roads and trails | 60 |

| Distribution Plant | |
|---|---|
| Struct and impvts | 45 |
| Station equip | 28 |
| Storage battery equip | 20 |
| Poles, towers & fixt | 35 |
| Overhead conductors and devices | 33 |
| Underground conduit | 60 |
| Underground conductors and devices | 40 |
| Line transformers | 28 |
| Services | 28 |
| Meters | 28 |
| Instals. on customers' premises | 25 |
| Street lighting and signal systems | 22 |

# Fast tax write-off for defense plants

The tax bill passed by Congress in October 1950 provides that a new plant can be depreciated in 5 years—if it provides additional capacity needed to serve the defense program. Adopted to speed up plant construction to supply needed materials and equipment, the first certificates of necessity permitting this 5-year amortization were issued to Jones & Laughlin Steel Corp., who had filed with the National Security Resources Board on Oct. 30, 1950. J&L's chairman of the board and president Ben Morrell had led a crusade for faster plant amortization (ENR Mar. 23, 1950, p. 189).

To date owners of about 500 different productive facilities have been granted some measure of, but not in all cases 100%, accelerated depreciation.

To write off the cost of your new plant in 5 years instead of the usual 20 or so for equipment, 50 for buildings, you must now apply to the Defense Production Adm. for a certificate of necessity. This certificate also qualifies you to apply for a defense loan from the government if you are unable to finance your essential project through the usual sources of construction capital.

The amount you can expect to write-off can be judged by the pattern laid down by W. Stuart Symington, chief of the National Security Resources Board, and now being followed by Gen. Wm. H. Harrison, Defense Production Administrator:

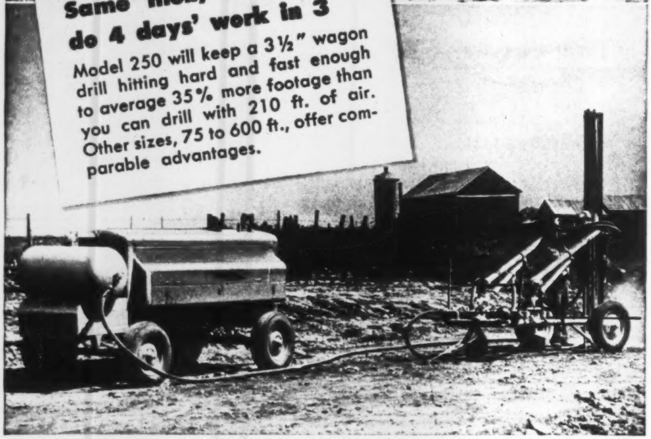
| | |
|---|---|
| 100% | for special purpose machine tools for production of military products exclusively—also finishing units for production of alkylates and aromatics from petroleum. |
| 90% | for general purpose machine tools, including process heating equipment—also supersonic wind tunnel—also lake ore carrier (converted steamship). |
| 85% | for blast furnaces; iron ore handling and processing facilities; coke ovens; special building for tank manufacture; conventional building for manufacture of guided missiles in locations suggesting doubtful post emergency utility; petroleum storage in certain areas; magnesium rolling mills; refractories; ferro-alloy smelting facilities. |
| 80% | for alumina and aluminum reduction plant; bauxite; plant for processing of blood plasma; freight cars; inland waterway barges for petroleum and raw materials for steelmaking; lake ore carrier (conventional). |
| 75% | for basic petroleum refining; steelmaking furnaces; blooming mills and soaking pits; scrap preparation and handling facilities; plants for production of superphosphate in which Atomic Energy Comm. is interested; conventional factory buildings and extensions in industrial locations. |
| 70% | for finishing facilities for high alloy steels; diesel powered tugs and tow boats; cement plants in certain areas. |
| 65% | for diesel electric locomotives; wood pulp facilities of certain types; cotton gins in certain locations. |
| 60% | for steel plant finishing facilities. |
| 50% | for high tenacity rayons; paper mills of certain types. |

Continued on page 159

# "new standard" Jaeger Compressors

**15% to 25% more air — 30% to 40% more work**

Model 125 runs 2 heavy breakers at full pressure instead of weak 70 lbs. You can break pavement at least ⅓ faster than with any 105 ft. unit.



**Same men, same tools do 4 days' work in 3**

Model 250 will keep a 3½" wagon drill hitting hard and fast enough to average 35% more footage than you can drill with 210 ft. of air. Other sizes, 75 to 600 ft., offer comparable advantages.

Why starve your modern air tools with "old standard" compressors that have not increased their air output in 19 years? Jaeger Air-Plus standards provide the increased air you need to power today's tools at their full efficiency—*at the lowest cost per foot of air of any compressors on the market.*

***See your Jaeger distributor or send for complete Catalog***

**THE JAEGER MACHINE COMPANY**

**200 Dublin Ave., Columbus 16, Ohio**

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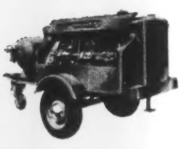
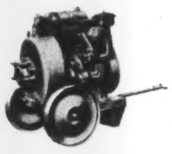
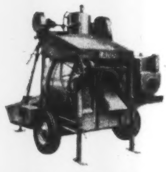


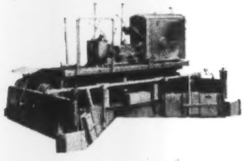
"Air Plus" Compressors,
75 to 600 cfm



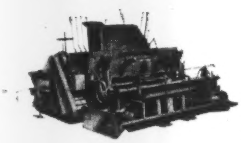
"Sure Prime" Pumps,
3600 to 240,000 gph



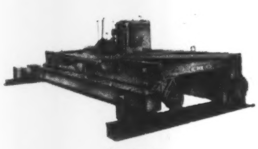
"Speedline" Mixers,
3½ S to 16 S



Paver-Type Aggregate Spreaders



Model BP-5 Bituminous Pavers



Concrete
Screw-and-Screed Spreaders,
Diagonal Screed Finishers

## Fast tax write-off

Continued from page 157

Forms for applying for certificates of necessity can be obtained from these field offices of the Department of Commerce which have been taken over by the National Production Adm.:

Albuquerque, N. Mex., 203 W. Gold Ave.
Atlanta 3, Ga., 50 Whitehall St. S. W.
Baltimore 2, Md., 103 S. Gay St.
Boston 9, Mass., 1800 Customhouse
Buffalo 3, N. Y., 117 Ellicott St.

Butte, Mont., 14 W. Granite St.
Charleston 3, S. C., 18 Broad St.
Cheyenne, Wyo., 206 Federal Office Bldg.
Chicago 4, Ill., 332 S. Michigan Avenue
Cincinnati 2, Ohio, 105 W. Fourth St.

Cleveland 14, Ohio, 925 Euclid Avenue
Dallas 2, Tex., 1114 Commerce St.
Denver 2, Colo., 828 Seventeenth St.
Detroit 26, Mich., 230 W. Fort St.
El Paso, Tex., 206 U. S. Courthouse Bldg.

Hartford 1, Conn., 135 High St.
Houston 14, Tex., 602 Federal Office Bldg.
Jacksonville 1, Fla., 311 W. Monroe St.
Kansas City 6, Mo., 911 Walnut St.
Los Angeles 12, Calif., 312 N. Spring St.

Louisville 2, Ky., 631 Federal Bldg.
Memphis 3, Tenn., 229 Federal Bldg.
Miami 32, Fla., 36 NE First St.
Milwaukee 2, Wis., 517 E. Wisconsin Ave.
Minneapolis 1, Minn., 401 2nd Ave., So.

Mobile 10, Ala., 109-13 St. Joseph St.
New Orleans 12, La., 333 St. Charles Ave.
New York 4, N. Y., 42 Broadway
Oklahoma City 2, Okla., 102 NW Third St.
Omaha 2, Nebr., 1319 Farnam St.

Philadelphia 6, Pa., 437 Chestnut St.
Phoenix, Ariz., 234 N. Central Ave.
Pittsburgh 19, Pa., 700 Grant St.
Portland 4, Oreg., 520 SW Morrison St.
Providence 3, R. I., 24 Weybosset St.

Reno, Nev., 118 W. Second St.
Richmond 19, Va., 801 E. Broad St.
St. Louis 1, Mo., 1114 Market St.
Salt Lake City 1, Utah, 350 S. Main St.
San Francisco 11, Calif., 555 Battery St.

Savannah, Ga., 125-29 Bull St.
Seattle 4, Wash., 909 First Ave.

These industries have received 5-year amortization certificates in the ratios as shown:

### Certificates of necessity for fast tax amortization by industry, As of March 2, 1951

| Industry | No. certs. appr. | $ value of facil. (millions) | % of cost Given 5-yr Amort. # |
|---|---|---|---|
| Iron and steel.. | 118 | $1,900 | 60-85% |
| Railroads ..... | 34 | 244 | 65-80 |
| Water transp'n. | 26 | 88 | 80-90 |
| Aircraft ....... | 81 | 126 | 75-90 |
| Refractories ... | 39 | 43 | 85 |
| Magnesium .... | 9 | 28 | 85 |
| Autos and tanks | 20 | 65 | 75-85 |
| Electronics .... | 17 | 25 | 75 |
| Fibrous glass .. | 4 | 9 | 75 |
| Munitions ..... | 16 | 30 | Up to 100 |
| Aluminum ..... | 4 | 400 | 80 |
| Cement ....... | 5 | 31 | 70 |
| Paper & lumber. | 19 | 196 | 50-65 |
| Fuels ......... | 25 | 98 | 75-100 |
| All others ..... | 76 | 116 | 50-100 |
| **Total** .......... | **493** | **$3,045.7** | **74 % Aver.** |

Since Mar. 2, 313 more certificates of necessity for tax benefits have been issued for expansion to cost an estimated $1.183 billion.

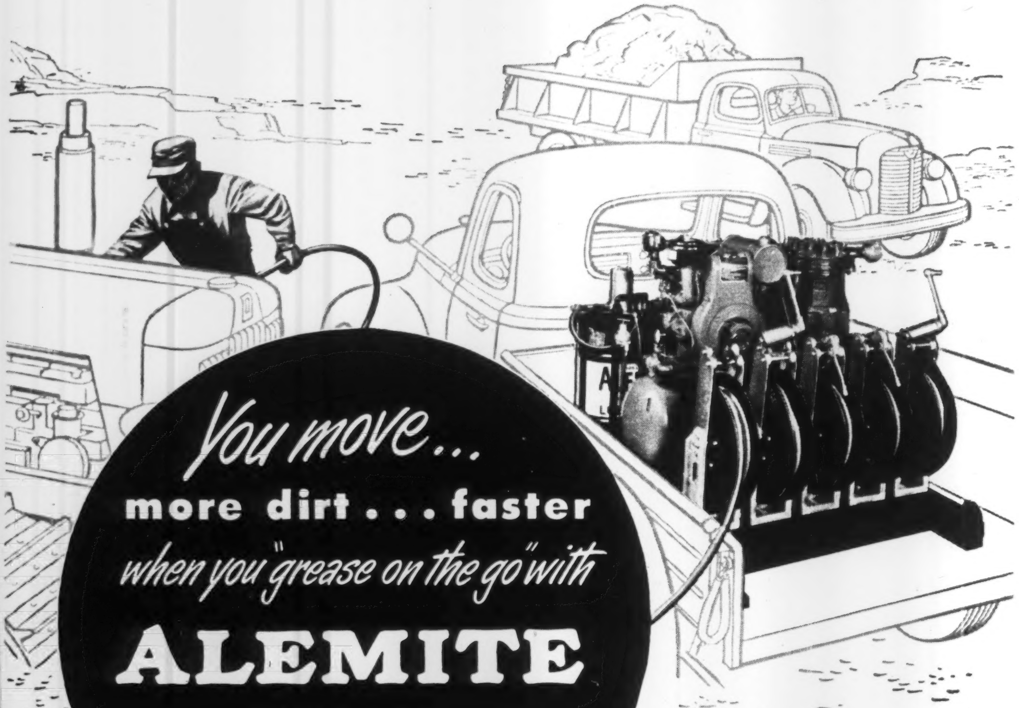
Memorandum covering amortization of emergency facilities under Section 124-A of Internal Revenue Code, dated Mar. 1, 1951, is available from Office of the Administrator, Defense Production Administration.

## Construction equipment depreciation schedule

The January, 1942, revision by the U. S. Bureau of Internal Revenue of its 1931 Schedule F of probable useful life and depreciation rates allowable for income tax purposes is still in use. Annual depreciation rates are computed on a straight-line basis. For example, on a probable useful life of ten years, annual depreciation is 10%; on 25-yr. life, annual depreciation is 4%. Probable useful life is shown below:

### CONSTRUCTION EQUIPMENT

| | Years |
|---|---|
| Automobiles: Light.... | 2 |
| Medium 3; Heavy... | 5 |
| Backfillers, power: | |
| Light 3; Medium.... | 5 |
| Heavy 6; Tractor.... | 5 |
| Barges: | |
| Steel 30; Wood...... | 25 |
| Batcher plants: | |
| All steel, demount.... | 10 |
| Steel frame, wood bin | 10 |
| Stationary.......... | 14 |
| Wood frame and bin. | 7 |
| Batch, meas. devices. | 4 |
| Benders, bar.......... | 5 |
| Bending blocks........ | 10 |
| Bending mach.: Angle | 15 |
| Pipe & Rail......... | 10 |
| Bins: Steel, concrete... | 6 |
| Steel 12; Wood...... | 8 |
| Bin frames, steel...... | 6 |
| Blacksmith shop, port.. | 4 |
| Blocks, pulley, differential........... | 6 |
| Blowers, mechanical.... | 10 |
| Boilers: Upright....... | 7 |
| Locomotive.......... | 15 |
| Stationary.......... | 20 |
| Borers (wood), port.... | 3 |
| Boring apparatus, test.. | 10 |
| Boxes, mortar & batch. | 3 |
| Brakes: Bending....... | 10 |
| Cornice (sheet metal) | 22 |
| Breakers, pav.; pneu... | 3 |
| Buckets: Cableway.... | 6 |
| Clamshell 6; Concrete | 5 |
| Elevator............ | 5 |
| Orange peel......... | 6 |
| Bail, pivot turnover.. | 5 |
| Scraper or drag line.. | 6 |
| Buggies: Concrete..... | 3 |
| Timber............. | 3 |
| Building, job office or storage. (Life of job) | |
| Bulldozers: | |
| Gradebuilders....... | 8 |
| Tractor............. | 4 |
| Burner equip.; gas & oil | 12 |
| Cables, wire.......... | 4 |
| Cableways, cable only.. | 3 |
| Cableway carriage..... | 5 |
| Camping equip........ | 3 |
| Capstans, electric...... | 10 |
| Cars: Ballast spreader.. | 10 |
| Batch box, steel..... | 5 |
| Boarding and tool... | 20 |
| Concrete............ | 8 |
| Derrick, bridge...... | 10 |
| Dump, steel 8; wood. | 6 |
| Flat, steel 12; wood.. | 10 |
| Hand, Hopper, Scale. | 10 |
| Skip hoist 10; Tank.. | 20 |
| Carts, concrete......... | 3 |
| Carts, tool (steel)...... | 4 |
| Cement gun machines.. | 4 |
| Chains: | |
| Hawsers and lines.... | 6 |
| Power, transmissions. | 5 |
| Channelers, rock....... | 6 |
| Chipping and calking tools, pneumatic..... | 3 |
| Chutes, con.; gravity... | 2 |
| Clamps, column form.. | 5 |
| Clean mach. for exterior of bldg.; steam or sand | 15 |
| Compressors: | |
| Belt driven.......... | 10 |
| Electric, portable.... | 8 |
| Gasoline, portable... | 6 |
| Motor-truck unit.... | 5 |
| Steam portable...... | 6 |
| Conc. mach., pneumatic | 5 |
| Concrete mixers: Elec. | 5 |
| Gasoline, 3½s, 5s, 7s.. | 3 |
| Gasoline, 10s, 14s.... | 4 |
| Gasoline, 21s, 28s.... | 5 |
| Paving, gas, steam... | 8 |
| Truck mounted...... | 5 |
| Controllers, motor..... | 12 |
| Conveyors: | |
| Belt, elevating— | |
| Portable............ | 3 |
| Stationary.......... | 6 |
| Bucket............... | 6 |
| Cable—Drag........ | 6 |
| Monorail........... | 15 |
| Chain, portable...... | 6 |
| Portable 5; Scraper.. | 6 |
| Cranes: | |
| Bridge and cantilever. | 20 |
| Crawler—Electric— | |
| 2½, 5 tons........ | 5 |
| 10, 15 tons........ | 7 |
| 20 tons and over... | 9 |
| Gas—2½, 5 tons..... | 5 |
| 10, 15 tons........ | 9 |
| 20 tons and over... | 12 |
| Locomotive gas.... | 7 |
| Steam—2½, 5 tons... | 6 |
| 10, 15 tons........ | 10 |
| 20 tons and over... | 12 |
| Locomotive........ | 10 |
| Dragline........... | 10 |
| Universal (gas, 2½ to 5 ton), mounted on 10-ton truck...... | 6 |
| Dock or wharf, travel. | 20 |
| Craneways: Steel...... | 15 |
| Wood............... | 10 |
| Crushers, rock: Port... | 8 |
| Stationary.......... | 10 |
| Cutters: Bar, power.... | 5 |
| Corru. iron, hand.... | 10 |
| Cut & weld outfits, port | 4 |
| Derricks: Boat........ | 10 |
| Circle swing, hand... | 8 |
| Crab—hand 16; power | 10 |
| Guy—Steel, 12; Wood | 8 |
| Stiffleg—steel 12; wood | 8 |
| Diggers, clay, pneu.... | 3 |
| Drag lines: | |
| Electric—½, ¾ cu. yd.. | 6 |
| 1, 1¼ and 1½ cu. yd. | 8 |
| 2 cu. yd. & over... | 10 |
| Gasoline—½, ¾ cu. yd. | 5 |
| 1, 1¼ & 1½ cu. yd.. | 9 |
| 2 cu. yd. and over. | 12 |
| Steam—½, ¾ cu. yd... | 6 |
| 1, 1¼ and 1½ cu. yd. | 10 |
| 2 cu. yds. & over.. | 12 |
| Dredges: Clamshell.... | 16 |
| Dipper 8; Hydraulic | 20 |
| Pipe............. | 10 |
| Drill boats........... | 12 |
| Drill points, well... | 5 |
| Drills: Airdrifter....... | 3 |
| Elec. or pneu., hand, for wood or metal. | 5 |
| Hand, electric....... | 3 |
| Rock, electric....... | 3 |
| Jackhammer........ | 3 |
| Steam............. | 5 |
| Traction, well....... | 7 |
| Tripod............. | 7 |
| Tunnel carriage..... | 5 |
| Well............... | 10 |
| Drums for oil (steel)... | 10 |
| Elevators: | |
| Bucket, stationary... | 6 |
| Cage (steel tower)... | 5 |
| Engines: | |
| Blowing 12; Fire..... | 7 |
| Gas 10; marine 20; oil. | 20 |
| Plumbing 14; Steam.. | 11 |
| Excavators: | |
| Cableway; complete.. | 4 |
| Trench, gasoline— | |
| 7-ft. & 12-ft. depth. | 6 |
| 18-ft. depth....... | 8 |
| Trench, steam— | |
| 7-ft. & 12-ft. depth. | 8 |
| 18-ft. depth....... | 10 |
| Trench, vert. boom.. | 5 |
| Wheel or ladder type. | 5 |
| Extinguishers, fire..... | 3 |
| Fans, exhaust......... | 15 |
| Finishing machines.... | 4 |
| Floats, bridge (steel)... | 5 |
| Forges, gas or oil....... | 10 |
| Forms: | |
| Conc. (metal pans)... | 5 |
| Conc., supports, adj.. | 4 |
| Steel, for— | |
| Pavements 4; Pipes.. | 3 |
| Roads 4; Walls...... | 5 |
| Tunnels & conduits | 4 |
| Furnaces, metal melting: | |
| Coal fired 10; Electric | 12 |
| Gas or oil........... | 7 |
| Generator sets: | |
| Steam engine........ | 12 |
| Turbine, headlight or floodlight....... | 4 |
| Gin poles (steel)....... | 10 |
| Graders: Blade, road— | |
| 7, 8 foot blade....... | 4 |
| 9, 10 foot blade...... | 5 |
| over 10-foot blade. | 8 |
| Elevating........... | 8 |
| Form, subg. planers.. | 6 |
| Rooters, wheel...... | 5 |
| Grinders: Metal surface. | 15 |
| Saw filers & setters.. | 14 |
| Surface, concrete.... | 4 |
| Hammers: Electric..... | 3 |
| Pneumatic riveting... | 3 |
| Heaters, asphalt, tar, and pitch kettles.... | 4 |
| Helmets, gas and diving suits and equip..... | 10 |
| Hoists: Chain......... | 6 |
| Air, electric, or steam | 8 |
| Elec. monorail or post | 5 |
| Gas 6; Hand power... | 8 |
| Slew, elect. 8, steam.. | 12 |
| Holders on pneumatic.. | 4 |
| Hose: Fire, linen or rubber lined cotton..... | 5 |
| Metal, flexible....... | 10 |
| Oil 5; Reel or cart... | 10 |
| Rubber, air, steam or water............. | 10 |
| Inundators, batch..... | 4 |
| Jacks: Hyd. 8; Rail.... | 25 |
| Rachet 8; Screw..... | 5 |
| Push and pull....... | 3 |
| Jibs, steam........... | 17 |
| Jointers, bench, electric, steam or gas........ | 5 |
| Ladders: Steel......... | 3 |
| Ladles, metal.......... | 7 |
| Lathes: Metal working. | 15 |
| Woodworking....... | 17 |
| Levee construction | |
| Drag lines.......... | 8 |
| Shovels............ | 8 |
| Tower excavators... | 12 |
| Life-saving equipment.. | 10 |
| Light plant........... | 4 |
| Lighters.............. | 22 |
| Loaders, bucket: | |
| Crawler and Portable | 5 |
| Stationary.......... | 6 |
| Locomotive battery.... | 4 |
| Locomotives, industrial: | |
| Diesel 10: Eectric... | 16 |
| Gas-Up to 10 tons... | 8 |
| 10 to 20 tons........ | 15 |
| Over 20 tons...... | 20 |
| Steam— | |
| Up to 10 tons..... | 8 |
| 10 to 20 tons...... | 18 |
| Over 20 tons...... | 20 |
| Locomotives, std. gage. | 30 |
| Magnets, lifting....... | 15 |
| Mixers: port. mortar... | 3 |
| Less than ½ cu. yd... | 6 |
| Over ½ cu. yd....... | 8 |
| Caterpillar.......... | 8 |
| Motors: | |
| AC and DC—Large.. | 12 |
| Medium 10; Small... | 8 |
| Hydraulic 5; Pneu... | 5 |
| Mowers, right of way... | 5 |
| Pile drivers: Railroad.. | 10 |
| Barge 8; Track...... | 12 |
| Steam, on skids..... | 10 |
| Pile hammers steam or air; Heavy........ | 10 |
| Light 4; Medium.... | 5 |
| Pipe: Black or galv. | 4 |
| Wood.............. | 5 |
| Wood & steel comb.. | 6 |
| Pipe lines & fittings for floating dredges..... | 10 |
| Pit and quarry plants.. | 6 |
| Planers: Metalworking. | 15 |
| Woodworking....... | 20 |
| Plows: Furrow 3; Rooter | 6 |
| Presses, drill........... | 12 |
| Pumping units: | |
| Eectric—Centrifugal, Diaphragm, Piston, Gas—Centrifugal, Diaphragm....... | 6 |
| Hwy. contr's pump | 4 |
| Piston............ | 5 |
| Steam, centrifugal... | 10 |
| Pumps: Air lift........ | 10 |
| Centrifugal, Humdinger, Impulse....... | 6 |
| Hydraulic 15; Oil.... | 10 |
| Steam piston unit.... | 6 |
| Testing for pipe lines. | 15 |
| Punches, hydraulic..... | 20 |
| Punches for steel, pwr.. | 15 |
| Racks, storage, for pipe and steel: | |
| Steel 20; Wood...... | 15 |
| Rails, steel............ | 10 |
| Rasing equip., for bldgs | 8 |
| Reamers: Elec., Pneu... | 3 |
| Riveters, pneumatic.... | 5 |
| Rollers: | |
| Conc. finishing (steel) | 10 |
| Road, gas, steam.... | 10 |
| Rolls, ridge........... | 5 |
| Sand-blast outfits..... | 10 |
| Sawmills, portable..... | 10 |
| Saws: Band, cut-off and rip, power........ | 10 |
| Hand, Elec. & pneu.. | 3 |
| Saws and woodworkers: | |
| Steel frames 10; Wood | 5 |
| Scales, large, track and wagon............ | 20 |
| Scarifiers: Attachments. | 4 |
| Blocks, steerable.... | 5 |
| Drag, all steel....... | 4 |
| Grader type........ | 4 |
| Scrapers: Blade, carryall | 6 |
| Fresno or Morman... | |
| Rotary 4; Slip 2; Wheel | 5 |
| Screens and bunkers, for gravel pits only..... | 5 |
| Screens, revolving..... | 6 |
| Sharpeners, drill...... | 8 |
| Shears, for steel, hand.. | 10 |
| Shores, adjustable..... | 4 |
| Shovel attach......... | 6 |
| Shovels: Elec. or gas., crawler or wheel— | |
| ½, ¾ cu. yd........ | 5 |
| 1, 1¼, 1½ cu. yd... | 6 |
| 2 cu. yd. and over. | 8 |
| Steam, craw, or wh— | |
| ½, ¾ cu. yd....... | 7 |
| 1, 1¼, 1½, cu. yd.. | 8 |
| 2 cu. yd. and over | 10 |
| Railroad, steam..... | 10 |
| Tunnel............. | 4 |
| Spouting plants, comp.; concrete........... | 4 |
| Spraying equip.; paint.. | 12 |
| Spreaders, stone: | |
| Hopper wagon...... | 5 |
| Steel box.......... | 5 |
| Switches: Portable..... | 4 |
| Stationary......... | 5 |
| Tampers, backfill, pneumatic.......... | 3 |
| Tamping machines.... | 10 |
| Tanks: Gasoline, storage and Relay.......... | 6 |
| Water or air, storage (steel)............ | 10 |
| Water storage (wood) | 14 |
| Tarpauline and tents... | 3 |
| Thread cut. mach., pipe | 10 |
| Tongs, chain.......... | 4 |
| Towers: Cableway— | |
| Steel 6; Wood...... | 3 |
| Steel boom with counterweights.... | 5 |
| Tractors: Electric— | |
| 3-ton 3; 5-ton 5; 10-ton 6; 20-ton...... | 8 |
| Gas or steam— | |
| 3-ton 4; 5-ton 6; 10-ton 8; 20-ton..... | 10 |
| Trailers: | |
| Dump—Steel or Wood. | 10 |
| Platform, wood...... | 4 |
| Drop plat., hvy. duty | 5 |
| Transformers, car...... | 10 |
| Trench. mach. (See Excav.) | |
| Trucks auto: General purpose or dump— | |
| ½–¾ cu. yd......... | 3 |
| 1–1½ cu. yd......... | 5 |
| 2 cu. yd. & over..... | 8 |
| Tugs. screw-propelled, steam or gas........ | 25 |
| Vises................ | 5 |
| Wagons: Dump— | |
| Steel or Wood....... | 6 |
| Road oilers, tank, steel | 10 |
| Tank or sprinkler— | |
| Steel 10; Wood.... | 8 |
| Washers, gravel....... | 3 |
| Welders, acet. or elec... | 10 |
| Wheelbarrows......... | 2 |
| Winches, elec. and pneu | 10 |
| Wire and cables: Elec.. | 6 |
| Flexible, steel armored | |



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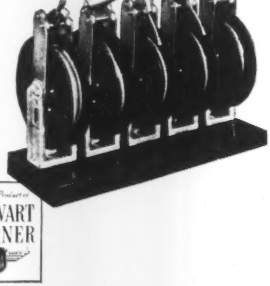

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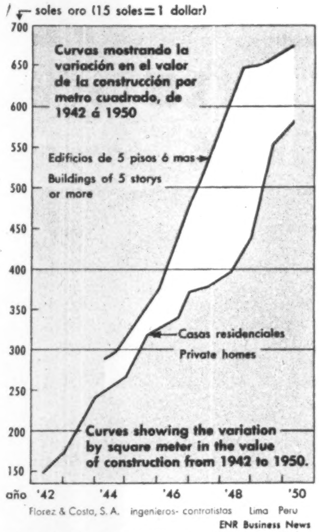


BUILDING COSTS rise in Peru, too. This trend chart came to ENR via McGraw-Hill World News, courtesy of Florez & Costa, S. A., Lima.

# Civilian hospital costs studied

Federal-aid hospitals put under contract in 1950 developed a wide range of unit costs. Minimum construction contract cost per square foot at $12.33 compares with a maximum just double that. Cubic foot costs range from a minimum of 85 cents to a maximum of $2.10, and total project cost, which includes furniture and movable equipment, also architects' and consulting fees, ranges from a per-bed cost of $8,860 to a maximum of $21,923.

This study of costs of general hospitals by the Division of Hospital Facilities, Public Health Service, Federal Security Agency, covered 33 general hospitals approved for federal aid in April and May, 1950, and 12 general hospitals approved for federal aid in July 1950. In addition, costs are given for one TB hospital, one mental hospital, 15 hospital additions, five nurses' homes, two employee dormitories and nine health centers.

These costs, analyzed by time for the two general hospital groups, show an increase of 7% from April and May to July in the average square foot cost, 6% in the average cube foot cost, and only 3½% in the average cost-per bed. The smaller increase in cost per bed is due to a reduction in the square feet of gross floor area per bed in the second group.

With 45 cost records to work with, these can be analyzed by size according to number of beds, also by space use in square feet per bed, by height of the building and the facilities provided, and by the section of the United States in which the hospitals are built. The nearest approach to a consistent pattern on costs shows up in this geographical analysis. South and West of Mississippi states tend to produce the lower unit costs. That leaves New England, Middle Atlantic, Middle West and Far West vying for the higher costs.

The one-story hospitals walk off with the lowest minimum cost but they also take top position in high maximum.

Any number of hospitals that have laundries produced better unit costs than other hospitals that did not provide for a laundry. Some of the elevator-equipped hospitals make a better showing on unit costs than those without elevators.

The accompanying tables line up these unit costs in half a dozen different ways. You can pay your money and take your choice.

These hospitals score extremes in their construction costs, either maximum unit costs or minimum:

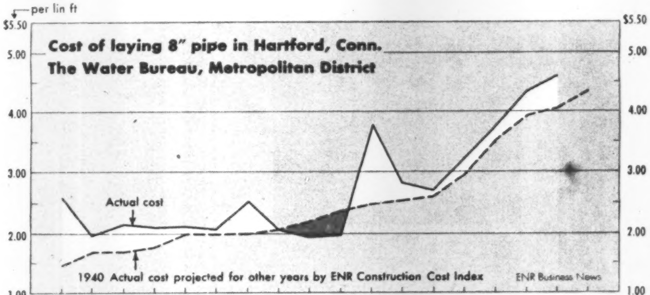
- **The maximum cost** title in the March to June group of general hospitals on both square foot and cubic foot bases and also the maximum for one-story hospitals goes to a 50-bed building at Carmi, Ill., that provides 720 sq ft per bed. This is a one-story and part basement building with exterior masonry walls, reinforced concrete pier foundations and floor slab with crawl space, concrete roof slab on bar joists, steel framing, composition roofing and a laundry. Bids were opened in June. Contract cost per sq ft is $24.11, per cu ft it is $2.10. The per bed cost is $20,000 next to maximum.

- **The maximum cost per bed** is $21,923 for a 26-bed building in Marysville, Ohio, with 884 sq ft per bed. This is a one-story and part basement building, exterior masonry walls, concrete floor with crawl space and roof slabs on bar joists. It has a laundry.

- **Maximum square foot and cubic foot** cost for a two-story hospital goes to a 28-bed building at Buffalo, Minn., with 509 sq. ft of floor space per bed. This has exterior masonry walls, concrete floor and roof slabs on bar joists, one elevator and a laundry. Contract cost per sq ft is $20.63, cost per cu ft is $1.85. The cost per bed is only $12,740.

- **Maximum cost per bed** for two-story hospitals goes to the 40-bed building for Iola, Kansas, which provides 684 sq ft per bed. This is two-stories and part-basement, has exterior of archtectural concrete, reinforced concrete framing, floor and roof slabs; tar and gravel roof, one elevator and a laundry. The cost per bed is $15,472.

- **For a three-story hospital,** the maximum unit cost all across the board is for



Actual cost of laying 8-in. pipe in Hartford in 1940, projected by means of the ENR Construction Cost Index, is compared here with actual costs as reported by The Water Bureau. Machine work prevails after 1940.

## Cost of laying pipe in Hartford, Conn., 1933–49

**From Manager's office, The Water Bu., The Metropolitan Dist., per linear foot (without overhead)**

| Year | Size | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2"a | 3" | 4" | 6" | 8" | 10" | 12" | 16" | 20" | 24" | 30" | 42" |
| 1933 | ...... | ...... | $2.48e | $1.945 | $2.60 | $3.56 | $2.703 | ...... | ...... | ...... | ...... | ...... |
| 1934 | ...... | ...... | ...... | 1.785 | 1.978 | 1.883 | 3.295 | $6.04 | ...... | ...... | ...... | ...... |
| 1935 | ...... | $0.885 | 1.033 | 1.69 | 2.12 | 2.06 | 3.685 | ...... | ...... | $13.707 | ...... | ...... |
| 1936 | $1.863 | 0.933c | 1.935 | 1.77c | 2.008c | 3.858 | 3.238g | 3.163h | ...... | ...... | ...... | ...... |
| 1937 | ...... | ...... | 1.148 | 1.649 | 2.119 | ...... | 4.260 | 8.658i | ...... | 16.581 | ...... | ...... |
| 1938 | ...... | ...... | 2.638d | 1.725b | 2.075b | ...... | 4.299b | 5.581b | 6.638b | ...... | ...... | ...... |
| 1939 | ...... | ...... | ...... | 1.834 | 2.518 | ...... | 3.417 | ...... | ...... | ...... | ...... | ...... |
| 1940 | ...... | ...... | ...... | 1.649 | 2.065 | ...... | 3.865 | ...... | ...... | ...... | ...... | ...... |
| 1941 | 0.597 | ...... | 1.875 | 1.839 | 1.941 | 5.205 | 4.064 | 4.057 | ...... | ...... | ...... | $43.238 |
| 1942 | 0.913a | ...... | 1.282 | 1.471 | 1.980 | 2.700 | 3.420 | 7.722 | 18.531 | 19.304 | ...... | ...... |
| 1943 | 1.013b | 3.112d | ...... | 1.576b | 3.879b | ...... | ...... | 26.487d | ...... | ...... | 29.213b | ...... |
| 1944 | 3.636 | ...... | ...... | 4.030 | 2.820 | ...... | 5.403 | 13.863 | ...... | ...... | ...... | ...... |
| 1945 | 4.033 | ...... | 4.503 | 6.357 | 2.717 | 4.038 | 3.932 | ...... | ...... | ...... | ...... | ...... |
| 1946 | 0.611 | ...... | 2.513 | 4.258 | 3.244 | 4.469 | 3.822 | 6.313 | ...... | ...... | ...... | ...... |
| 1947 | ...... | ...... | 3.321 | 3.409 | 3.737 | 4.051 | 6.387 | 7.684 | ...... | ...... | ...... | ...... |
| 1948 | ...... | ...... | 3.324 | 3.805 | 4.337 | 5.375 | 6.474 | 8.561 | ...... | ...... | ...... | ...... |
| 1949 | ...... | ...... | 6.847f | 3.466 | 1.603 | ...... | 5.944 | 8.203 | ...... | ...... | ...... | ...... |

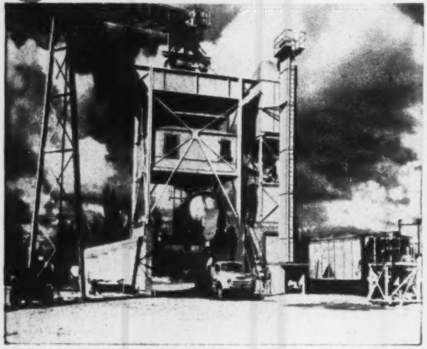
• a 2" and 3" Precaulked C. I. Pipe • b Incl machine work • c Machine work with trenching furnished • d Practicall all hand work • e High cost dua to short length laid in state road under bad weather conditions • f Main laid in walk area • g W.P.A. job • h Temporary main laid on ground • i Incl. small amount of machine work

Note: In general the lower pipe laying costs 1931-1936 are due to contract work, use of relief labor for trenching or trenching urnished by real estate developers

# SEE *what* ERIE *offers* *for* CONCRETE *projects*

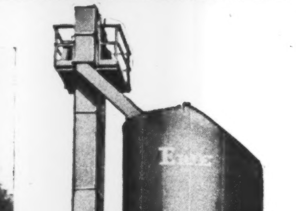
THE Erie Portable Concrete Plant at the left has produded 3275 cu. yds. of air entrained concrete for tunnel and spillway at the Burr Oak Dam sight. This plant features 20 cu. yd., 3 compartment bin loaded by integral 60 T. P. H. bucket elevator with materials batched thru hydraulically controlled 3 beam AggreMeter with 4th beam for water weighing. One man operates all controls, a helper feeds bag cement. Takes about an hour to set up this plant and less to knock down for moving to next job.

Erie Portable Concrete Plant made 3275 cu. yds. of concrete at Burr Oak Dam in Ohio.



Erie 3 yard Wet and Dry batch Concrete Plant includes Type CTB 160 cu. yds. 3-compartment AggreMeter Plant connected to Erie M-3 492 bbl. single compartment Cement Bin loaded by undertrack hopper to vertical 50 T. P. H. bucket elevator. Produces up to 500 yards of concrete per day.

Erie G. T. B. 79 yard 3-compartment bin with 3 yd. Erie AggreMeter. Equipped with adjustable columns to raise or lower bin for charging batch trucks or truck mixers. Write for bulletin on the complete line of GTB Bins.



Erie CSB 592 bbl. Silo Type Cement Bin, 11 ft. diameter. Available in 11 & 12 ft. diameters in many capacities for elevated or ground storage of bulk cement.

***Write for Booklet 2L-2 for complete data on the line of Erie 2-line Contractor Buckets.***

**ERIE**

**STEEL CONSTRUCTION COMPANY**

**115 GEIST ROAD • ERIE, PENNSYLVANIA**

a 42-bed building at Palmer, Mass., which provides 741 sq ft per bed. This has exterior masonry walls, stone trim, reinforced concrete floor and roof slabs, composition roofing, one elevator and no laundry. Contract cost per sq ft is $23.82, cost per cu ft is $1.84. The project cost per bed is $19,771.

• **Maximum unit costs** in the July group of general hospitals across the board are for a 10-bed building at Loyalton, Calif., which provides 595 sq ft per bed. This is a one-story hospital with concrete block exterior walls, roof of wood planks on wood joists, and no laundry. Contract cost per sq ft is $24.68, per cu ft it is $2.06. The project cost per bed is $18,000.

• **Minimum costs skip around more.** In the April-May group of hospitals minimum square foot cost, also minimum square foot cost for a one-story hospital, goes to a 20-bed building at Lisbon, N. D., that provides 795 sq ft per bed. This has one-story and basement, exterior masonry walls, concrete floor and roof slabs on bar joists, pitch and gravel roof and a laundry. Contract cost per sq ft is $12.33. The project cost per bed is $11,763.

• **Minimum cost per cubic foot** is for a 27-bed hospital at Dawson, Ga. which allows 587 sq ft per bed. This has one story and part basement, exterior masonry walls, reinforced concrete floor slab, wood roof structure with a hip roof, asbestos tile shingles and no laundry. Contract cost per cu ft is $0.85. The project cost per bed is $9,414.

• **Minimum project cost per bed** is $8,860 for a 30-bed hospital at Malta, Mont., which provides 493 sq ft per bed. This is a one-story and part basement building with exterior masonry walls, concrete floor slabs on bar joists with crawl space, wood roof structure with a hip roof, asbestos shingles and a laundry.

• **Minimum square and cube** costs for a two-story building are for a 50-bed hospital at Swainsboro, Ga., which provides 707 sq ft per bed. This has two-stories and part basement, exterior masonry walls, steel framing, concrete floor and gypsum roof slabs on bar joists, composition roofing, two elevators and no laundry. Contract cost per sq ft is $13.78, per cu ft it is $1.21. The project cost per bed is $11,836.

• **Minimum cost per bed** for two-story hospitals goes to Morris, Minn., a 50-bed building that provides 525 sq ft per bed. This has exterior masonry walls, concrete floor and roof slabs on bar joists, pitch and gravel roof, one elevator and a laundry. The project cost per bed is $10,893.

• **For three-story buildings,** the minimum contract cost per square foot and the minimum cost per bed are for a 93-bed hospital at Bristol, Tenn., which provides 561 sq ft per bed. This is three stories and basement providing 52,155 sq ft for the hospital and a three-story 21,315 sq ft doctors wing. It has exterior concrete and masonry wall, steel framing, concrete floor and roof slabs on bar joists, composition roofing, three elevators and a laundry. Contract cost is $14.83 per sq ft. The project cost per bed is abount $10,000.

• **Minimum cube cost** for three story buildings goes to the 50-bed hospital at Windsor, N. C., that provides 638 sq ft per bed. This has exterior masonry walls, reinforced concrete foundation and first floor slab, concrete slabs on bar joists for other floors and roof, composition roofing, no laundry. Contract cost is $1.26 per cu ft. The project cost per bed is $12,440.

• **In the July group** of general hospitals the minimum cost per square foot is for an 18-bed building at Pawnee City, Neb., that provides 702 sq ft per bed. This is a one-story and basement building with exterior masonry walls, reinforced concrete floor and roof slabs on steel bar joists and includes a laundry. Contract cost is $14.13 per sq ft. Its project cost per bed is $12,107.

• **Minimum cost per cubic foot is** for a 45-bed hospital at Wynne, Ark., which provides 516 sq ft per bed. This is a one-story building with reinforced concrete footing and foundation walls, concrete floor and roof slab on steel bar joists, exterior masonry walls and no laundry. Contract cost is $1.20 per cu ft. The project cost per bed is $12,620.

• **Minimum cost per bed** is for 50-bed hospital at Centreville, Miss., that provides 434 sq ft per bed. This is a one-story building with exterior masonry walls, concrete floor and roof slabs on bar joists and no laundry. The project cost per bed is $9,036.

# Average costs of hospitals and health centers

**Analyzed from Study by Federal Security Agency, Public Health Service, Division of Hospital Facilities**

| | | | Construction contract cost | | | | | | Project cost | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1950 | per sq ft | | | per cu ft | | | per sq ft | | | per bed* | | |
| Hospitals | No | Date | max | aver | min | max | aver | min | max | aver | min | max | aver | min |
| General | 33 | Apr-May | $24.11 | $16.78 | $12.33 | $2.10 | $1.38 | $0.85 | $27.78 | $20.18 | $14.80 | $21,923 | $13,089 | $8,860 |
| General | 12 | July | 24.68 | 17.96 | 14.13 | 2.06 | 1.46 | 1.20 | 30.25 | 21.54 | 17.25 | 18,000 | 13,503 | 9,036 |
| Increase in cost | | | +2.5% | +7% | +15% | −2% | +6% | +41% | +9% | +7% | +16% | −18% | +3⅓% | +1⅓% |
| Increase ENR Bldg Cost Index | | | | 4% | | | 4% | | | | | | | |
| | | | | median | | | | | | median | | | median | |
| TB | 1 | May | ..... | 15.42 | ..... | .... | 1.27 | ..... | ..... | 18.78 | ..... | ...... | 9,870 | ..... |
| Mental | 1 | Mar | ..... | 12.71 | ..... | .... | 1.08 | ..... | ..... | 13.74 | ..... | ...... | 6,169 | ..... |
| Additions | 15 | Mar-Jun | 24.28 | 16.50 | 13.00 | 1.93 | 1.41 | 1.17 | 29.95 | 19.58 | 14.95 | 17,100 | 11,207 | 4,800 |
| Nurses homes | 5 | Mar-Apr | 12.48 | 10.32 | 8.40 | 1.14 | 1.05 | 0.83 | 14.64 | 12.57 | 9.88 | 4,705 | 3,033 | 2,750 |
| Empl. dorms | 2 | Mar-Apr | 10.88 | ..... | 9.60 | 1.01 | .... | 0.87 | 12.22 | ..... | 11.00 | 2,470 | ...... | 2,449 |
| Health Ctrs. | 9 | Mar-May | 30.94 | 14.78 | 10.15 | 3.44 | 1.14 | 0.75 | 36.12 | 17.66 | 11.81 | ...... | ...... | ..... |

- Contract costs are taken from bids obtained for construction of buildings, built-in equipment, site preparation and approach work and construction contingencies.
- Project cost includes contract construction costs and in addition all furniture and movable equipment, architects' and consultants' fees and other expenditures allowable by the Hospital Survey and Construction Act.

* Smaller increase in costs per bed is due to decrease in gross floor area per bed for the hospitals approved in July 1950.

## BY SIZE

| | Number of beds | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 29 General hospitals I | | | 12 General hospitals II | | | 15 Additions | | |
| | max | med | min | max | med | min | max | med | min |
| | 202 beds | 40 beds | 15 beds | 106 beds | 26–25 | 10 beds | 155 beds | 70 beds | 16 beds |
| | N J | Colo-Kans | Mont | Ga | Wis-Ky | Calif | Tex | N Car | Tex |
| **CONSTR. CONTRACT COST** | | | | | | | | | |
| Per sq ft | $17.57 | $16.55-19.27 | $15.25 | $17.15 | $17.24-19.44 | $24.68 | $24.28 | $16.50 | $15.57 |
| Per cu ft | 1.71 | 1.34-1.60 | 1.14 | 1.43 | 1.37-1.70 | 2.06 | 1.84 | 1.38 | 1.43 |
| **PROJECT COST** | | | | | | | | | |
| Per sq ft | 21.17 | 20.40-22.64 | 17.54 | 20.02 | 19.70-24.28 | 30.25 | 29.95 | 19.58 | 17.87 |
| Per bed | 12,670 | 12,481<br>15,472 | 16,622 | 14,774 | 15,665<br>17,313 | 18,000 | 17,100 | 11,102 | 6,545 |

## BY SPACE USE

| | Sq ft per bed | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | General hospitals I | | | General hospitals II | | | Additions | | |
| | max | med | min | max | med | min | max | med | min |
| | 948 sq ft | 638 sq ft | 447 sq ft | 795 sq ft | 660 sq ft | 434 sq ft | 927 sq ft | 535 sq ft | 296 sq ft |
| | Mont | N Car | Miss | Wis | Ga-Del | Miss | Mich | Fla | N Y |
| **CONSTR. CONTRACT COST** | | | | | | | | | |
| Per sq ft | $15.25 | $16.30 | $17.32 | $17.24 | $14.92-21.37 | $18.51 | $13.48 | $13.86 | $19.94 |
| Per cu ft | 1.14 | 1.26 | 1.27 | 1.37 | 1.30-1.84 | 1.43 | 1.26 | 1.17 | 1.80 |
| **PROJECT COST** | | | | | | | | | |
| Per sq ft | 17.54 | 19.78 | 21.55 | 19.70 | 17.69-25.16 | 22.44 | 14.95 | 15.54 | 24.52 |
| Per bed | 16,622 | 12,440 | 9,630 | 15,665 | 11,850<br>16,359 | 9,036 | 13,859 | 8,308 | 7,007 |

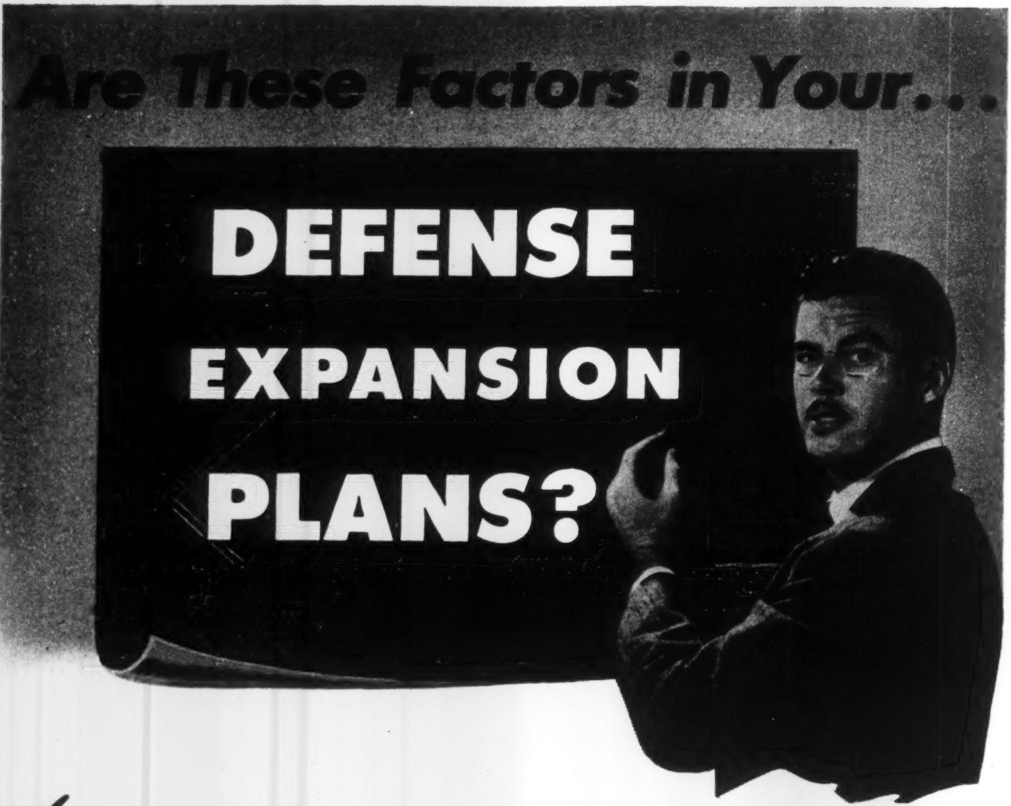
## BY HEIGHT AND FACILITIES

| | | Construction contract cost | | | | | | Project cost | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | per sq ft | | | per cu ft | | | per sq ft | | | per Bed | | |
| Height of facilities | No. | max | med | min | max | med | min | max | med | min | max | med | min |
| 1-STORY | (29) | | | | | | | | | | | | |
| nb, nl | (7) | $24.68 | $16.56 | $13.65 | $2.06 | $1.30 | $0.88 | $30.25 | $19.78 | $16.69 | $18,000 | $10,215 | $9,036 |
| pb, nl | (5) | 21.37 | 17.32 | 12.63 | 1.84 | 1.46 | 0.85 | 25.16 | 21.55 | 16.05 | 16,359 | 10,317 | 9,414 |
| pb, l, el | (1) | 18.25$^{1}$ | 18.25$^{1}$ | 18.25$^{1}$ | 1.17$^{1}$ | 1.17$^{1}$ | 1.17$^{1}$ | 21.64$^{1}$ | 21.64$^{1}$ | 21.64$^{1}$ | 15,583$^{1}$ | 15,583$^{1}$ | 15,583$^{1}$ |
| b, nl | (1) | 14.34 | 14.34 | 14.34 | 1.36 | 1.36 | 1.36 | 17.27 | 17.27 | 17.27 | 11,390 | 11,390 | 11,390 |
| pb, l | (10) | 24.11 | 15.90 | 13.44 | 2.10 | 1.32 | 0.91 | 27.78 | 18.83 | 16.85 | 21,923 | 13,208 | 8,860 |
| pb, spl, el | (1) | 19.44 | 19.44 | 19.44 | 1.70 | 1.70 | 1.70 | 24.28 | 24.28 | 24.28 | 17,313 | 17,313 | 17,313 |
| b, l | (3) | 14.22 | 14.13 | 12.33 | 1.31 | 1.21 | 1.07 | 17.25 | 17.09 | 14.80 | 15,527 | 12,107 | 11,763 |
| b, l, q | (1) | 17.42 | 17.42 | 17.42 | 1.58 | 1.58 | 1.58 | 20.72 | 20.72 | 20.72 | 13,996 | 13,996 | 13,996 |
| All 1-story | (29) | $24.68 | $16.23 | $12.33 | $2.10 | $1.32 | $0.85 | $30.25 | $19.31 | $14.80 | $21,923 | $12,657 | $8,860 |
| 2-STORY | (6) | | | | | | | | | | | | |
| nb, nl, el | (1) | $14.92$^{1}$ | $14.92$^{1}$ | $14.92$^{1}$ | $1.30$^{1}$ | $1.30$^{1}$ | $1.30$^{1}$ | $17.69$^{1}$ | $17.69$^{1}$ | $17.69$^{1}$ | $11,850$^{1}$ | $11,850$^{1}$ | $11,850$^{1}$ |
| nb, l | (1) | 20.63 | 20.63 | 20.63 | 1.85 | 1.85 | 1.85 | 25.02 | 25.02 | 25.02 | 12,740 | 12,740 | 12,740 |
| nb, l, el | (1) | 16.83$^{1}$ | 16.83$^{1}$ | 16.83$^{1}$ | 1.45$^{1}$ | 1.45$^{1}$ | 1.45$^{1}$ | 20.74$^{1}$ | 20.74$^{1}$ | 20.74$^{1}$ | 10,893$^{1}$ | 10,893$^{1}$ | 10,893$^{1}$ |
| pb, l, el | (2) | 19.27$^{1}$ | 17.66 | 16.04$^{2}$ | 1.62$^{2}$ | 1.61 | 1.60$^{1}$ | 22.64$^{1}$ | 20.78 | 18.92$^{2}$ | 15,472$^{1}$ | 13,922 | 12,371$^{2}$ |
| pb, nl, el | (1) | 13.78$^{2}$ | 13.78$^{2}$ | 13.78$^{2}$ | 1.21$^{2}$ | 1.21$^{2}$ | 1.21$^{2}$ | 16.74$^{2}$ | 16.74$^{2}$ | 16.74$^{2}$ | 11,836$^{2}$ | 11,836$^{2}$ | 11,836$^{2}$ |
| All 2-story | (6) | $20.63 | $16.83 | $13.78 | $1.85 | $1.45 | $1.21 | $25.02 | $20.74 | $16.74 | $15,472 | $11,850 | $10,893 |
| 3-STORY | (8) | | | | | | | | | | | | |
| nb, nl | (2) | $23.82 | $.... | $16.30 | $1.84 | $.... | $1.26 | $26.67 | $.... | $19.78 | $19,771 | $..... | $12,440 |
| b, nl, el | (2) | 16.59$^{2}$ | .... | 15.90$^{1}$ | 1.31$^{2}$ | .... | 1.27$^{1}$ | 20.27$^{2}$ | .... | 18.60$^{1}$ | 13,985$^{2}$ | ..... | 12,620$^{1}$ |
| b, l, el, opd | (1) | .... | 19.53 | .... | .... | 1.70 | .... | .... | 22.75 | .... | ..... | 17,531 | ..... |
| b, l, el | (3) | 17.65$^{2}$ | 17.15$^{3}$ | 14.83$^{3}$ | 1.43$^{3}$ | 1.32$^{3}$ | 1.29$^{2}$ | 21.61$^{3}$ | 20.02$^{3}$ | 17.62$^{3}$ | 14,774$^{3}$ | 14,054$^{2}$ | 10,000$^{3}$ |
| All 3-story | (8) | $23.82 | $16.87 | $14.83 | $1.84 | $1.32 | $1.26 | $26.67 | $20.15 | $17.62 | $19,771 | $14,020 | $10,000 |
| 4-STORY | (1) | | | | | | | | | | | | |
| nb, l, el | (1) | .... | $22.06$^{1}$ | .... | .... | $1.80$^{1}$ | .... | .... | $25.11$^{1}$ | .... | ..... | $14,392$^{1}$ | ..... |
| 6-STORY | (1) | | | | | | | | | | | | |
| b, l, el, c, opd | (1) | .... | $17.57$^{3}$ | .... | .... | $1.71$^{3}$ | .... | .... | $21.17$^{3}$ | .... | ..... | $12,670$^{3}$ | ..... |

• b—basement; • nb—no basement; • pb—part basement; • l—laundry; • nl—no laundry; • spl—space for laundry;
• el—elevator; • c—cafeteria • q—quarters for 10 sisters; • opd—out patient dept.
• $^{1}$ 1 elevator; • $^{2}$ 2 elevators; • $^{3}$ 3 elevators.

## BY REGION

| | | Construction contract cost | | | | | | Project cost | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | per sq ft | | | per cu ft | | | per sq ft | | | per bed | | |
| Area in which built | No. | max | med | min | max | med | min | max | med | min | max | med | min |
| **General hospitals** | | | | | | | | | | | | | |
| New England | (2) | $23.82 | $..... | $19.53 | $1.84 | $.... | $1.70 | $26.67 | $..... | $22.75 | $19,771 | $...... | $17,531 |
| Middle Atlantic | (2) | 21.37 | ..... | 17.57 | 1.84 | .... | 1.71 | 25.16 | ..... | 21.17 | 16,359 | ...... | 12,670 |
| South | (15) | 19.44 | 16.45 | 12.63 | 1.70 | 1.28 | .85 | 24.28 | 19.90 | 16.05 | 17,313 | 11,243 | 9,036 |
| Middle West | (6) | 24.11 | 19.48 | 17.24 | 2.10 | 1.65 | 1.37 | 27.78 | 23.20 | 19.70 | 21,923 | 15,028 | 13,996 |
| West of Miss | (17) | 20.63 | 15.25 | 12.33 | 1.85 | 1.30 | .91 | 25.02 | 17.96 | 14.80 | 16,622 | 11,819 | 8,860 |
| Far West | (3) | 24.68 | 16.04 | 14.43 | 2.06 | 1.62 | 1.59 | 30.25 | 18.91 | 18.54 | 18,000 | 12,371 | 10,317 |
| **Hospital additions** | | | | | | | | | | | | | |
| New England | (2) | $21.71 | $..... | $17.73 | $1.86 | $.... | $1.52 | $24.76 | $..... | $20.50 | $16,373 | $...... | $11,207 |
| Middle Atlantic | (2) | 21.54 | ..... | 19.94 | 1.80 | .... | 1.71 | 27.76 | ..... | 24.52 | 14,319 | ...... | 7,007 |
| South | (5) | 22.61 | 15.75 | 13.86 | 1.93 | 1.32 | 1.17 | 25.54 | 18.96 | 15.54 | 12,000 | 9,940 | 4,800 |
| Middle West | (3) | 18.53 | 13.48 | 13.00 | 1.41 | 1.27 | 1.26 | 21.95 | 15.57 | 14.95 | 16,854 | 13,859 | 6,840 |
| West of Miss | (3) | 24.28 | 15.57 | 15.49 | 1.84 | 1.43 | 1.41 | 29.95 | 19.41 | 17.87 | 17,100 | 16,352 | 6,545 |
| Far West | (0) | ..... | ..... | ..... | .... | .... | .... | ..... | ..... | ..... | ...... | ...... | ...... |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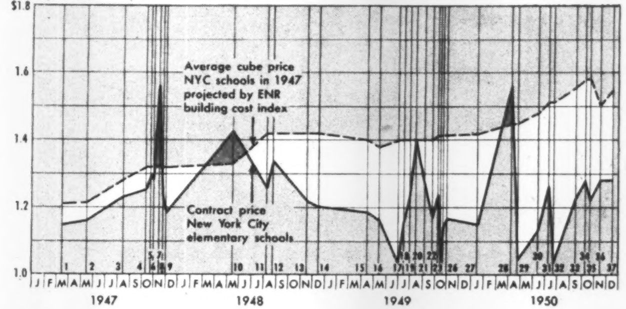
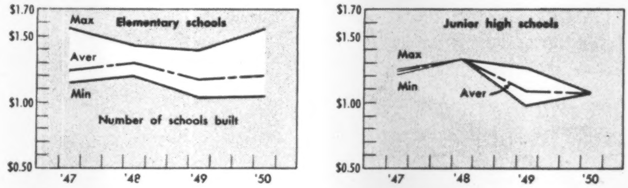
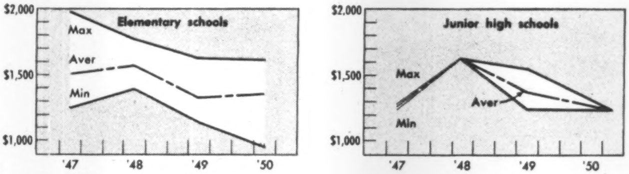
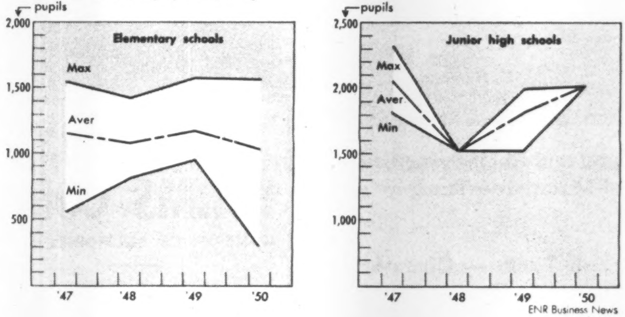

School construction costs—New York City


Cost per cu ft


Cost per pupil


Size of school—pupil capacity

ENR Business News

## Cost of schools built in New York City

General contract and mechanicals (furniture and movable equipment not included) reported by Eric Kebbon, Architect, Superintendent of School Buildings, Design and Construction, Board of Education of the City of New York

Elementary schools

| | | per cu ft | | | per pupil | | | capacity, no. of pupils | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | no. | max | aver | min | max | aver | min | max | aver | min |
| 1947 | (9) | $1.56 | $1.25 | $1.16 | $1,991 | $1,517 | $1,255 | 1,550 | 1;162 | 558 |
| 1948 | (5) | 1.43 | 1.30 | 1.20 | 1,784 | 1,581 | 1,399 | 1,433 | 1,094 | 806 |
| 1949 | (12) | 1.40 | 1.18 | 1.03 | 1,638 | 1,334 | 1,148 | 1,588 | 1,181 | 868 |
| 1950 | (11) | 1.55 | 1.20 | 1.04 | 1,612 | 1,357 | 957 | 1,581 | 1,036 | 302 |

Junior high schools

| | no. | max | aver | min | max | aver | min | max | aver | min |
|---|---|---|---|---|---|---|---|---|---|---|
| 1947 | (2) | 1.25 | 1.23 | 1.21 | 1,284 | 1,277 | 1,270 | 2,326 | 2,068 | 1,810 |
| 1948 | (1) | 1.32 | 1.32 | 1.32 | 1,623 | 1,623 | 1,623 | 1,518 | 1,518 | 1,518 |
| 1949 | (3) | 1.26 | 1.09 | 0.99 | 1,553 | 1,380 | 1,261 | 1,998 | 1,819 | 1,518 |
| 1950 | (1) | 1.07 | 1.07 | 1.07 | 1,210 | 1,210 | 1,210 | 2,012 | 2,012 | 2,012 |

## School costs—New York

New York City, in four years, built 37 elementary schools for costs that range from $1.03 per cu ft to $1.56 and 7 junior high schools at costs ranging from $0.99 to $1.32 a cu ft.

The investment per student ranges from $957 to $1,991 for elementary schools and from $1,210 to $1,623 for junior highs.

The sizes of schools built during this 1947-50 program range from a building with a student capacity of 302 to one that will accommodate 1,588 elementary pupils. The junior highs are larger—they range from 1,518 pupils to 2,326.

These costs, supplied by Eric Kebbon, Architect, Superintendent of School Buildings, Design and Construction, Board of Education, City of New York, cover the general contract, mechanical and electrical construction and equipment but not furniture and movable equipment.

The sizes of the contracts and locations follow of the elementary schools whose cube costs are reported on the accompanying time chart. An "economy program" was started in July, 1948.

## School costs—Washington

In Washington state average cost of school construction decreased from 1947-48 to 1949-50 to $10.55 per sq ft from their earlier highs of $12.49. In and near Seattle the cost was above the average and ranged from $11.27 for an elementary school to $16.59 for a high school. But costs were up in the second half of 1950. These costs, reported by Mrs. Pearl A. Wanamaker, state superintendent of public construction were pared by eliminating waste space, using functional materials and good design. They compare with $12 a sq ft for residential construction in Olympia, the state capitol; $19.50 for a Seattle bank, $30 for a veterans hospital in Seattle and $16.20 for Seattle's new Public Safety building and the Univ. of Washington's Health Sciences building.

## School costs—Cleveland

The sharp rise in school costs since defense mobilization started has been documented by Superintendent Mark C. Schinnerer of the Cleveland schools in a New York Times survey. In May, 1950 Cleveland let a contract for an elementary school at a contract price of 92¢/cf. In October a contract for another elementary school, almost identical, called for $1.10/cf. Shortly after that a third elementary school cost $1.20 and in March, 1951, a fourth elementary school cost $1.31/cf.

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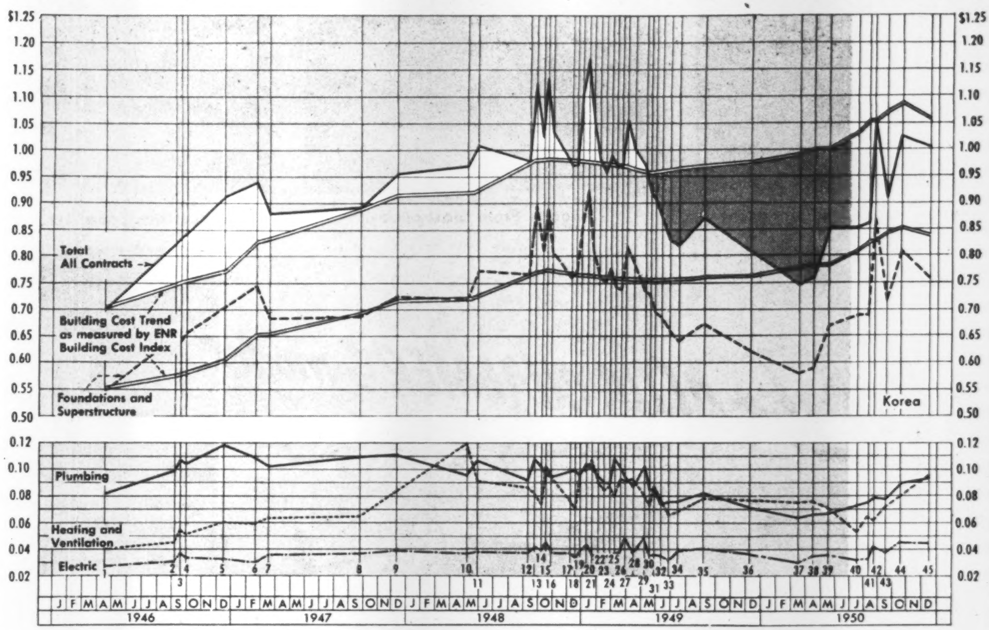
# Public housing construction costs—New York City Municipal Housing Authority



• 1—Elliott Houses • 2—Lincoln • 3—Brownsville • 4—Johnson • 5—Amsterdam • 6—Marcy • 7—Jacob Riis • 8—Lillian Wald • 9—Gowanus • 10—Astoria Sect. I • 11—Woodside • 12—Eastchester • 13—Smith Sect. I (Steel frame) • 14—Albany • 15—South Beach (Staten Island) • 16—Sheepshead Bay • 17—Bronx River • 18—Paterson • 19—Pelham Parkway • 20—Todt Hill (Staten Island) • 21—Nostrand • 22—Gun Hill • 23—Dyckman • 24—Glenwood • 25—Sedgwick • 26—Parkside • 27—Chas. W. Berry (Staten Island) • 28—Arverne • 29—Colonial Park • 30—Boulevard • 31—Lexington • 32—Ravenswood Sect. I • 33—Marble Hill • 34—Farragut Sect. I • 35—Melrose Sect. I • 36—Ravenswood Sect. II • 37—Astoria Sect. II • 38—Melrose Sect. II • 39—Farragut Sect. II • 40—St. Nicholas Sect. I • 41—Stephen Foster Sect. I • 42—Smith Sect. II • 43—Pononok • 44—Flushing Sects. I & II • 45—Breukelen

ENR Business News

New York City's Municipal Housing Authority let contracts in 1950 for 9 groups of housing at costs ranging from 74.9¢ to $1.053 per cu ft for the whole contract, 58.2¢ to 87.1¢ per cu ft for foundations and structure.

Since 1946 three classes of housing have been built which range in cost, as shown on the small table, from 69.9¢ to $1.168 per cu ft.

| No proj | Class of housing | Total contract cost per cu ft and bid date<br>Maximum | Median | Minimum |
|---|---|---|---|---|
| 20 | Low rent, fully subsidized | $1.114(9/48) | $0.886(2,3/47) | $0.699(4/46) |
| 5 | Spec. stds, part 2 City aided | 1.130(10/48) | 1.006(5/48) | 0.964(5/49) |
| 15 | Spec. stds, part 3 City aided | 1.168(1/49) | 0.965(3/49) | 0.807(12/49) |

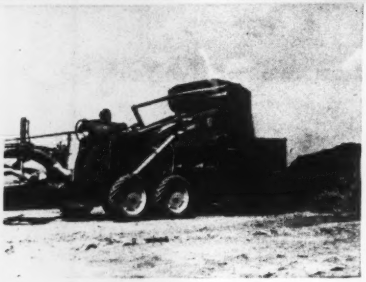
# Contract totals and unit prices on public housing

## 1950 awards by New York City Housing Authority

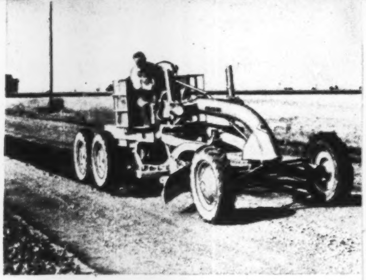
| Project Number | (37) | (38) | (39) | (40) | (41) | (42) | (43) | (44) | (45) |
|---|---|---|---|---|---|---|---|---|---|
| Project | Astoria II | Melrose II | Farragut II | St. Nicholas I | Stephen Foster I | Smith II | Pomonok | Flushing I & II | Breukelen |
| Total constr. rooms, No. | 2,955 | 2,162 | 1,769 | 1,811 | 2,852 | 3,211 | 7,793 | 1,655 | 6,674 |
| Total apartments, No. | 624 | 495 | 420 | 440 | 667 | 795 | 2,065 | 400 | 1,595 |
| Rooms per apartment, average, No. | 4.74 | 4.37 | 4.21 | 4.12 | 4.28 | 4.04 | 3.77 | 4.14 | 4.18 |
| Total cubage, cu. ft. | 6,216,837 | 4,372,941 | 3,509,102 | 4,046,371 | 5,975,000 | 6,676,490 | 19,315,843 | 3,668,503 | 14,297,000 |
| Bid date | 3/14/50 | 4/25/50 | 5/2/50 | 7/11/50 | 8/15/50 | 8/28/50 | 9/26/50 | 10/17/50 | 12/15/50 |
| **Total contract cost** | $4,665,039.00 | $3,341,744.00 | $2,987,603.00 | $3,445,566.00 | $5,174,154.00 | $7,034,098.00 | $17,603,800.00 | $3,776,416.00 | $14,347,169.00 |
| Cost per constr. room | 1,578.67 | 1,545.67 | 1,688.87 | 1,902.58 | 1,814.22 | 2,190.62 | 2,258.92 | 2,281.82 | 2,149.71 |
| Cost per apartment | 7,476.02 | 6,751.00 | 7,113.34 | 7,830.33 | 7,757.35 | 8,847.92 | 8,524.84 | 9,441.04 | 8,995.09 |
| Cost per cu ft | 0.749 | 0.764 | 0.852 | 0.852 | 0.866 | 1.053 | 0.911 | 1.029 | 1.003 |
| **Foundations and superstructures** | 3,623,552.00 | 2,569,797.00 | 2,377,732.00 | 2,809,433.00 | 4,135,876.00 | 5,816,690.00 | 13,950,050.00 | 2,984,197.00 | 11,008,392.00 |
| Cost per constr. room | 1,226.24 | 1,188.62 | 1,344.11 | 1,551.32 | 1,450.17 | 1,811.48 | 1,790.07 | 1,803.14 | 1,649.144 |
| Cost per apartment | 5,807.00 | 5,191.51 | 5,661.27 | 6,385.07 | 6,200.72 | 7,316.59 | 6,755.47 | 7,460.49 | 6,901.81 |
| Cost per cu ft | 0.582 | 0.587 | 0.678 | 0.694 | 0.692 | 0.871 | 0.722 | 0.813 | 0.769 |
| **Heating and ventilation** | 467,087.00 | 332,577.00 | 250,033.00 | 214,463.00 | 381,000.00 | 409,998.00 | 1,397,000.00 | 295,469.00 | 1,369,000.00 |
| Cost per constr. room | 158.06 | 153.83 | 141.51 | 118.42 | 133.59 | 127.68 | 179.26 | 178.53 | 205.12 |
| Cost per apartment | 748.53 | 671.82 | 596.02 | 487.40 | 571.21 | 515.72 | 676.51 | 738.67 | 858.30 |
| Cost per cu ft | 0.075 | 0.076 | 0 071 | 0.053 | 0.064 | 0.061 | 0.072 | 0.080 | 0.095 |
| **Electrical Construction** | 184,700.00 | 151,370.00 | 125,492.00 | 130,920.00 | 203,300.00 | 279,442.00 | 759,750.00 | 165,800.00 | 622,000.00 |
| Cost per constr. room | 62.50 | 70.01 | 70.94 | 72.29 | 71.28 | 87.03 | 97.49 | 100.18 | 93.19 |
| Cost per apartment | 295.99 | 305.80 | 298.79 | 297.50 | 304.80 | 351.50 | 367.92 | 414.50 | 389.97 |
| Cost per cu ft | 0.030 | 0.035 | 0.036 | 0.033 | 0.034 | 0.042 | 0.039 | 0.045 | 0.044 |
| **Plumbing** | 389,700.00 | 288,000.00 | 234,346.00 | 290,750.00 | 453,978.00 | 527,988.00 | 1,497,000.00 | 330,950.00 | 1,347,777.00 |
| Cost per constr. room | 131.87 | 133.21 | 132.47 | 160.55 | 159.18 | 164.42 | 192.09 | 199.97 | 201.94 |
| Cost per apartment | 624.50 | 581.82 | 557.97 | 660.81 | 680.63 | 664.11 | 724.93 | 827.38 | 845.00 |
| Cost per cu ft | 0.063 | 0.066 | 0.067 | 0.072 | 0.076 | 0.079 | 0.078 | 0.090 | 0.094 |
| **Piling or abnormal foundations** | 124,000.00 | 28,000.00 | 25,000.00 | 25,000.00 | 440,000.00 | 299,800.00 | 100,000.00 | 83,000.00 | 986,548.00 |

**Project costs are based on foundations, superstructures, (or general construction) including elevators, heating and ventilating, electric work, and plumbing. Contract costs shown do not include architects fees, inspection, piling or abnormal foundations, relocation of existing buildings, refrigerators, gas ranges, site improvements, or park developments.**

Maintains Roads and Streets



Loads From Stockpiles



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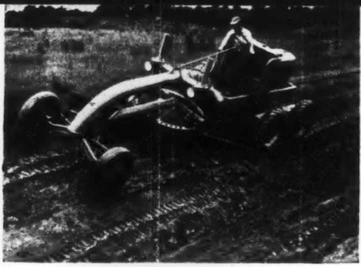

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Cuts and Cleans Ditches

Strips Sod

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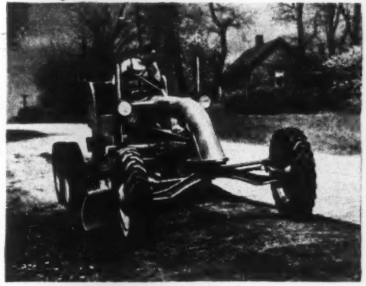
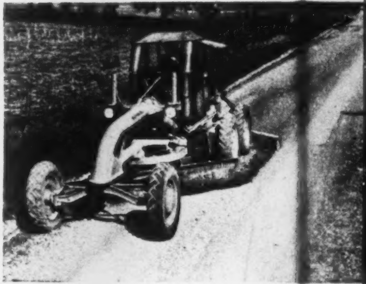
Finishes Between Forms



Grades Shoulders



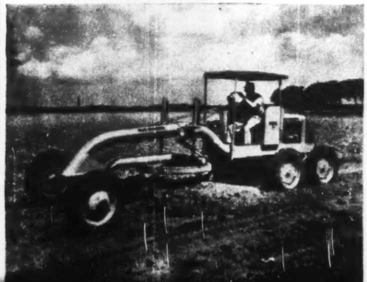
Feathers Out Windrows

Levels Subdivisions

Works and Spreads Oil Mix

Loads Surplus Dirt

Handles Terracing



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# MAJOR PROJECTS

## Buildings and housing

• **Alabama Livestock Coliseum**—Walls of this unusual structure in Montgomery, Ala., form a circular cylinder 340 ft in diameter. The roof is a thin reinforced concrete arched shell supported on and stiffened by ribs 375 ft long. Distance from floor to high point of roof is nearly 100 ft. The arched shape of the shell provides clearance for the stands, which rise 70 ft on each side of a 260x130-ft central arena.

• **Alcoa Building** — The new office building for the Aluminum Company of America in Pittsburgh will have 30 stories of office space, plus a penthouse and two basements (estimated cubage 6,800,000 cu ft). The structural steel frame is now being erected. It will be faced on the exterior with stamped aluminum sheets, backed up with a 4-in. lightweight aggregate wall. Windows will be double-glazed and reversible. Panel heating and cooling will be used for offices. The structure is expected to be ready for occupancy Jan., 1952.

• **Arnold Engineering Development Center** — Congress has authorized $157,500,000 for initial construction of facilities for testing supersonic aircraft, guided missiles and aircraft engines near Tullahoma, in south central Tennessee. Since last May, construction contracts totaling $15,200,000 have been awarded. Contracts to be awarded in 1951 will amount to about $30,000,000. Ultimately, the project will include a high-altitude engine test facility, a gas-dynamics group for supersonic and hypersonic wind tunnel experiments, and a propulsion wind tunnel. Supporting services and utilities include: a 5,000-acre reservoir, with a storage capacity of 100,000 acre-feet, impounded behind an earth-fill and concrete dam about 90 ft high at the center and 2,900 ft long; a pumping plant with an initial capacity of 100,000 gpm; a secondary concrete reservoir with a 14,600,000-gal. storage capacity; administration and engineering buildings, warehouses, a steam generating plant, an access railroad, streets, and water and sewerage systems. A total of about 41,000 acres of land will be required for the center.

**1407 Broadway, office building in New York City, rises to a height of 42 stories. (Kahn & Jacobs photo.)**

• **Atomic Energy Commission** — Among the larger projects under way are permanent facilities at Argonne National Laboratory, Chicago; expansion of facilities at Hanford, Wash., construction of a materials testing reactor and chemical processing plant at Arco, Idaho; new laboratories at Los Alamos, N. M.; permanent facilities and expansion of the gaseous diffusion plant at Oak Ridge, Tenn.; and a chemical processing plant near Newport, Ind. Work is just starting on a $500 million gaseous diffusion plant at Paducah, Ky., and a $600 million production plant being constructed at Aiken, S. C.

• **Caterpillar Tractor Plant**—Production will start this spring in the Caterpillar Tractor Company's new 920-720-ft manufacturing plant in Peoria, Ill. Scrapers will be the first units to come off the assembly lines, to be followed by bulldozers, wagons and rippers. Maximum production will be reached next January.

• **Continental Can Co.**—Operations started last fall in the Pittsburgh plant, which contains 700,000 sq ft of floor area. It is a one-story combination manufacturing and warehouse structure, with a two-story section for administrative offices. It has a structural steel frame. Grade beams and curtain walls are of precast concrete; cellular steel panels

(*Continued on page 174*)

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ON THIS SIDE
Data on the WeldELL line
TAYLOR FORGE SEAMLESS WELDING FITTINGS
TAYLOR FORGE ASA FORGED STEEL FLANGES
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# Case Study

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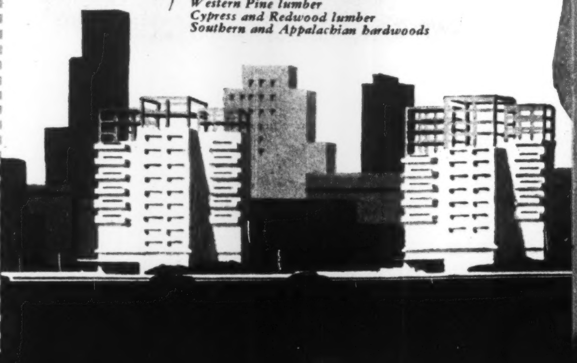
- *Poles and pilings*
- *Long leaf and short leaf Pine lumber and timbers*
- *Treated lumber and timbers*
- *Western Pine lumber*
- *Cypress and Redwood lumber*
- *Southern and Appalachian hardwoods*



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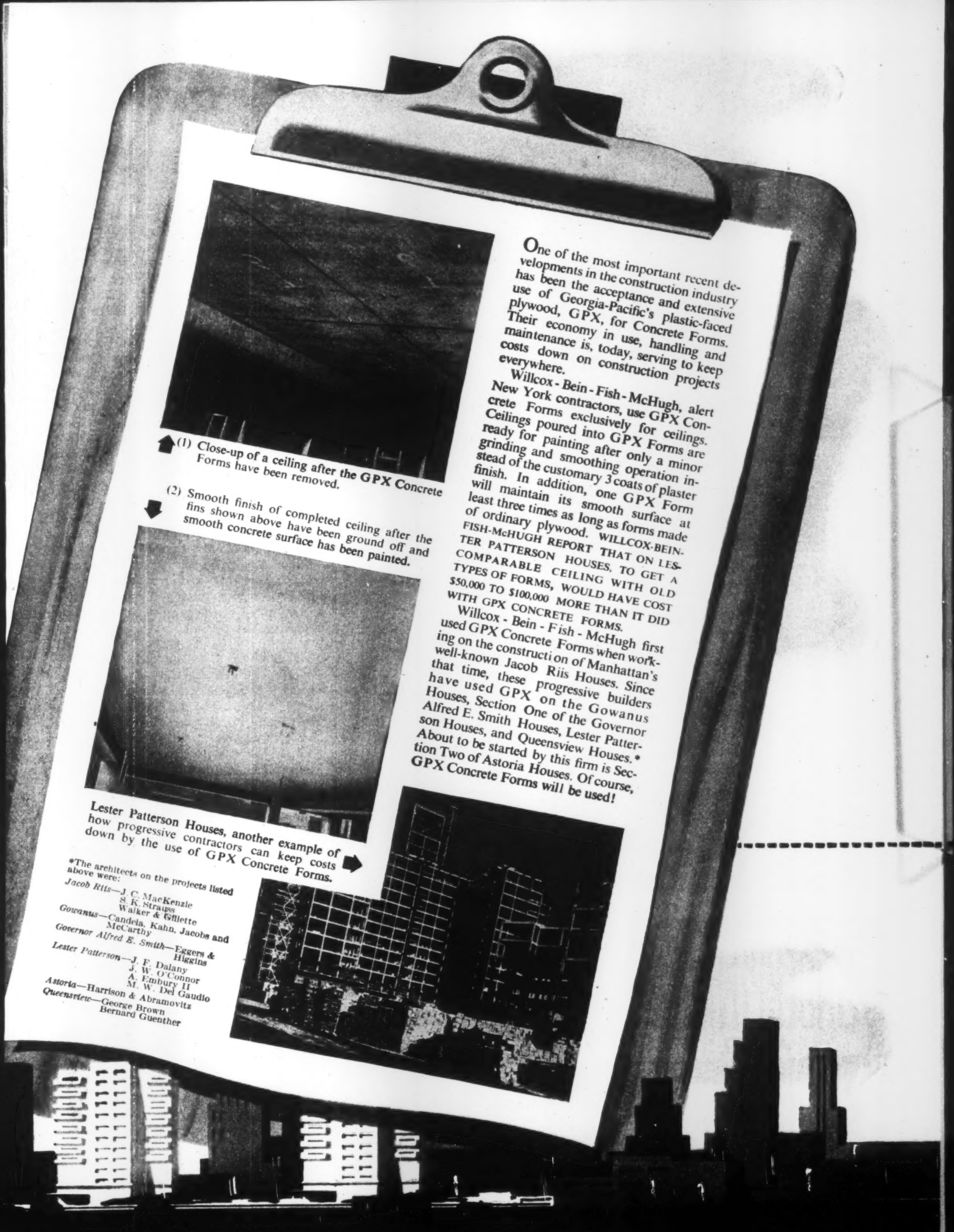

(1) Close-up of a ceiling after the **GPX Concrete** Forms have been removed.

(2) Smooth finish of completed ceiling after the fins shown above have been ground off and smooth concrete surface has been painted.

One of the most important recent developments in the construction industry has been the acceptance and extensive use of Georgia-Pacific's plastic-faced plywood, GPX, for Concrete Forms. Their economy in use, handling and maintenance is, today, serving to keep costs down on construction projects everywhere.

Willcox - Bein - Fish - McHugh, alert New York contractors, use GPX Concrete Forms exclusively for ceilings. Ceilings poured into GPX Forms are ready for painting after only a minor grinding and smoothing operation instead of the customary 3 coats of plaster finish. In addition, one GPX Form will maintain its smooth surface at least three times as long as forms made of ordinary plywood. WILLCOX-BEIN-FISH-McHUGH REPORT THAT ON LESTER PATTERSON HOUSES, TO GET A COMPARABLE CEILING WITH OLD TYPES OF FORMS, WOULD HAVE COST $50,000 TO $100,000 MORE THAN IT DID WITH GPX CONCRETE FORMS.

Willcox - Bein - Fish - McHugh first used GPX Concrete Forms when working on the construction of Manhattan's well-known Jacob Riis Houses. Since that time, these progressive builders have used GPX on the Gowanus Houses, Section One of the Governor Alfred E. Smith Houses, Lester Patterson Houses, and Queensview Houses.* About to be started by this firm is Section Two of Astoria Houses. Of course, GPX Concrete Forms will be used!

**Lester Patterson Houses, another example of how progressive contractors can keep costs down by the use of GPX Concrete Forms.**

*The architects on the projects listed above were:

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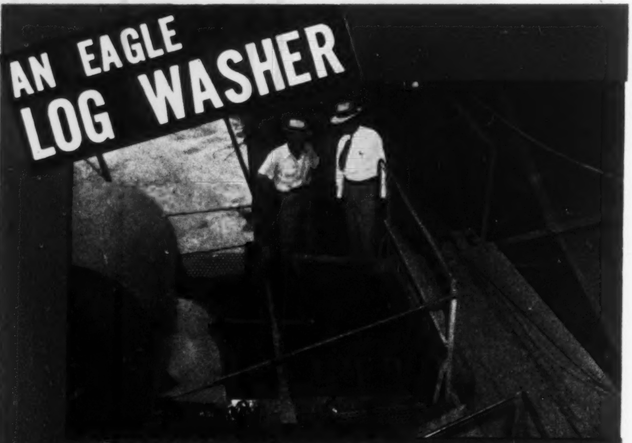
*Governor Alfred E. Smith*—Eggers & Higgins

*Lester Patterson*—J. F. Dalany
J. W. O'Connor
A. Embury II
M. W. Del Gaudio

*Astoria*—Harrison & Abramovitz

*Queensview*—George Brown
Bernard Guenther

AN EAGLE LOG WASHER



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GIFFORD-HILL & CO., Inc., for 25 years, one of the largest sand and gravel producers in the southwest, now operating 15 plants, were having clay trouble at their Fred plant in Trinity River bottoms near Dallas. A strata of tough plastic clay they encountered contaminated their sand and gravel so it could not pass Highway Department specifications. An Eagle 7'x24' Double Log Washer was installed—now material exceeds strictest specifications. The corrugated paddles cut loose even the gummiest clay—water currents rising from bottom of tub wash the loosened clay up and out! If you have clay or debris in your sand consult washer headquarters!

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ENGINEERS & CONTRACTORS
155 EAST 44th STREET, NEW YORK

(*Continued from page* 170)

cover the administrative section; and cane-fiber insulated asbestos-cement board was used for the remainder of the exterior. Roof is steel deck.

• **E. I. duPont de Nemours & Co.**—Construction started in November on a $7,500,000 plant in Memphis, Tenn., for the manufacture of sodium cyanide and is expected to be finished in early 1952. The May plant in Camden, S. C., for the production of Orlon acrylic fiber in the form of continuous filament yarn went into operation last July. The main building, 300x600 ft in plan, has a structural steel frame and jumbo-brick exterior walls. About the middle of 1950, construction started on a 250x1,000-ft addition for manufacturing Orlon acrylic fiber in staple form.

This spring, production of nylon chemicals will start in a plant on a 1,700-acre site ten miles south of Victoria, Texas. Another plant at the site is expected to be completed near the end of 1952.

Still another large project is the $30,000,000 expansion of research facilities at the Experimental Station in Wilmington, Del. Started in 1948, construction is scheduled to be completed late this spring. Ten new laboratories and semi-works buildings and 13 new service buildings were included in the project.

• **Electchester**—Construction is under way on the $20,000,000 cooperative housing project in Flushing, L. I., which is sponsored by principal employers and Local No. 3, International Brotherhood of Electrical Workers, AFL. The project will ultimately house 2,141 families on a 60-acre site. Initial occupancy of the first section, for 388 families, is scheduled for June. It will consist of four 3-story buildings and three four 6-story buildings.

• **First National Bank and Trust Co.**—The 20-story, $6,000,000 air-conditioned office building in Tulsa, Okla., was completed by mid-1950. It has a structural steel frame and brick and marble exterior.

• **525 Wm. Penn Pl Bldg.**—Expected to be completed in Pittsburgh, Pa., this summer, this structure has a structural steel frame and an exterior of limestone and stainless steel, with brick backup. Windows and spandrels were placed as single, story-high stainless-steel panels. Fully air-conditioned, the $28,000,000 building is 39 stories plus two penthouses high, 220x114 ft in plan.

• **Ford Motor Co**—Twelve major construction projects to be completed this year will add 6,846,500 sq ft (157 acres) of floor area for the company's expanding activities. Three of the plants will provide 3,500,000 sq ft for automotive manufacturing, one plant 1,400,000 sq ft for assembling automobiles, a plant extension 208,000 sq ft for making aircraft-engine lubrication pumps, an office building 1,000,000 sq ft, and six depots 738,500 sq ft for storage of automotive parts. Last year, the company completed its 355,000-sq ft automatic transmission manufacturing plant in Cincinnati, and by next year, it will have completed a 998,000-sq ft car-and-truck assembly plant in Kansas City, Mo. A foundry in Cleveland, Ohio, started last fall, will be finished early in 1952. Containing more than one million square feet of floor area, this plant is 1,390 ft long, 660 ft deep at one end, 540 ft at other.

- **1407 Broadway**—Covering an area of 45,000 sq ft at ground level, with an 11,272-sq ft tower above the 22nd floor, this air-conditioned office building in New York City rises to a height of 42 stories. It was completed last year at a cost of about $15,000,000. It has a steel frame and brick exterior. To eliminate piers from the exterior walls, the walls are carried on small struts in alternate window mullions, wind loads being transmitted to the inner heavy framing.

- **Gateway Center**—Demolition is under way in preparation for the first three office buildings in a 23-acre redevelopment of the Golden Triangle in Pittsburgh, Pa. To be 20 and 24 stories high, of steel-frame construction, the structures will be cross shaped in plan with wings about 50 ft wide and 73 ft long. Net area on each floor will be 13,000 sq ft. Estimated cost is about $50,000,000. Later, six more office buildings and a shopping center may be erected.

- **H. J. Heinz Co.**—Steel erection has been completed in Pittsburgh for a 3-story building 280x80 ft in plan. Steel will be left exposed for best acid protection. Vinegar storage tanks on the first floor and processing and bottling areas on upper floors will be enclosed in heat-resistant glass.

- **Hotpoint, Inc.**—Production of refrigerators could start this September in a new $20,000,000 plant in Chicago but for the probability of the entire plant being devoted to war production. The company already has a contract for making jet-engine components and expects to receive others. Construction of the new plant, containing a 700x

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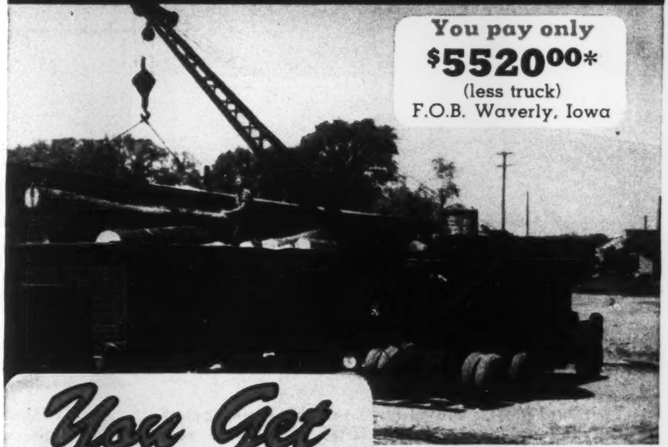

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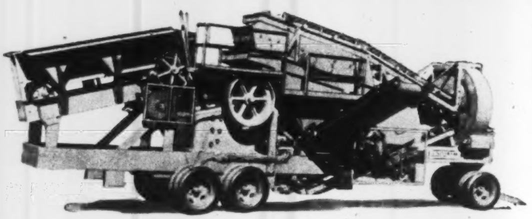
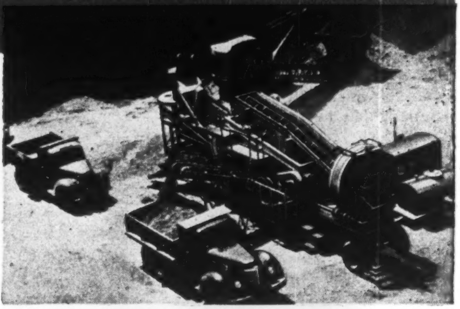
# 4 TOP PRODUCERS THAT INVITE COMPARISON





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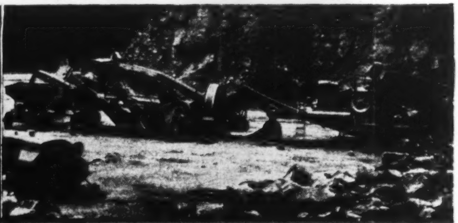
**3** TwinDual Master Gravel Plant—double the output of conventional two-stage plants of comparable size and weight

**4** TwinDual Secondary with 546P Primary. High capacity with two portable units for quarry operation



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700-ft main building and a 400x400-ft extension, was started in Mar., 1950. Total floor area is 610,000 sq ft. An integrated network of overhead conveyors in the two buildings will be 11 mi long.

- **Johnson's Wax Co.**—Research laboratory at Racine, Wisc., 154 ft high, with nine 40x40-ft main floors and six 38-ft dia mezzanines cantilevered from a central concrete core, has been completed. The exterior is made of horizontal glass tubing and plate glass, supported on aluminum posts and spanning between brick spandrels at the main floors.

- **Jones & Laughlin**—A $20,000,000 coal-preparation plant designed to process 2,000 tons of coal an hour was completed last summer at LaBelle, Pa. It consists of 14 buildings, mostly of concrete with asbestos-cement siding. Coal is carried across the Monongahela River from mines on the other side on a conveyor supported by a suspension bridge.

- **Lakewood Park**—Last year, 4,103 single-family houses were completed in this California development, which is planned to ultimately incorporate 17,150 low-cost homes. Construction started in Feb., 1950, and by Feb., 1951, 7,300 homes were finished. The same builders also constructed 4,033 houses elsewhere in 1950 and have started work on a shopping district in Lakewood Park.

- **Lever Brothers Co.**—Lever House, 21 stories high, will provide 290,000 sq ft of floor area and 4,250,000 cu ft of space for office use in New York City. The air-conditioned building will have a structural steel frame and an exterior of metal and glass, with cinder-concrete block behind the spandrels. Rails will run around the building to support window-cleaning equipment. The structural steel building frame is now being erected. In Los Angeles, a $25,000,000 plant for making soap and edible oil is now 70% completed and is expected to be in production by midyear.

- **Levittown**—During 1950, about 5,500 more single-family houses were added to this Long Island community, bringing the total to 16,000, which were all constructed by one builder —Levitt & Sons, of Manhasset, L. I. On-site mass-production methods are used; wood frames are precut, labor specialized.

- **Lincoln Electric Co.**—An $8,500,000 plant for manufacturing electric welding machines and electrodes in Cleveland, Ohio, will be ready for oc-

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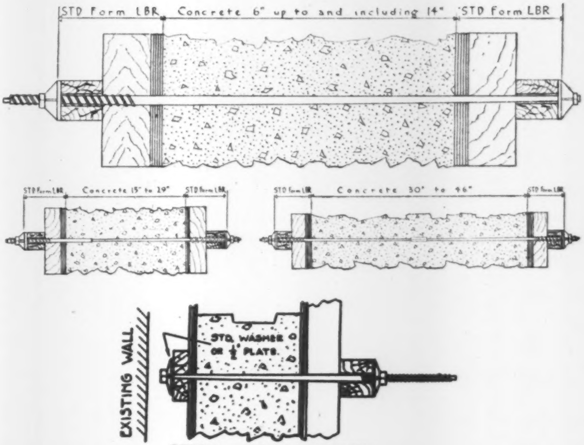

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|---|---|---|---|---|---|---|---|
|  | Large End | Small End |  |  |  | Min. | Max. |
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EARLE GEARS

**First National Bank and Trust Co. office building in Tulsa, 20 stories high, is air conditioned.**

cupancy next month. Mostly one story high, 1,427x500 ft in plan, the building has a structural steel frame and exterior walls made up of insulated aluminum-and-steel panels. The roof consists of insulated steel decking welded to the frame.

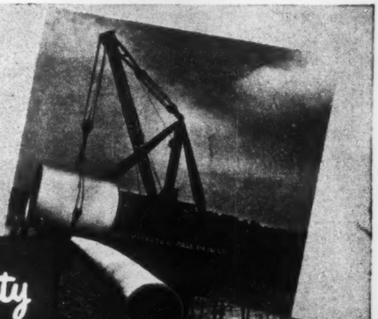
• **Manhattan House** – Occupying an entire block in New York City, the 20-story building contains 582 apartments of from two to seven rooms. It has a reinforced concrete frame and ceramic brick exterior facing. Five elevator cores are incorporated, thus eliminating need for long halls. Features include: recreational facilities, solariums and lounges for tenants on a terrace roof; outdoor balconies in most apartments above the sixth floor; and a garage for 200 cars under a garden. First tenants started moving in last October.

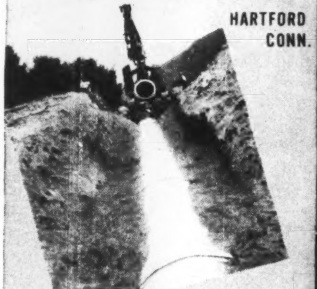
• **Meadowbrook Hospital**–A $10,000,000 expansion of the hospital at Hempstead, L. I., is expected to be completed next January. Designed in accordance with a master plan set up in 1933, the addition will add 4000 beds and many new facilities, bringing the total to 600 beds. New buildings include two patients' wings, two wings on the nurses' home, an administration building, a superintendent's residence, kitchen and operating building. Framing is chiefly reinforced concrete; walls are cinder block and face brick.

• **Metropolitan Life Insurance Co.**– A large housing program in California is now being completed. At Parklabrea in Los Angeles, 18 buildings, each 13 stories high, will add 2,937 apartments to the 1,316 constructed there before World War II interfered.

(*Continued on p. 181*)

NEW YORK CITY


BOSTON MASS.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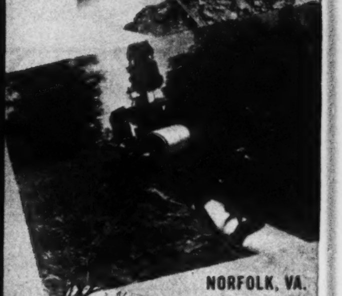
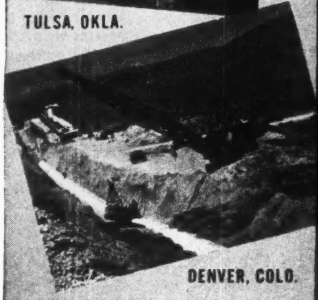
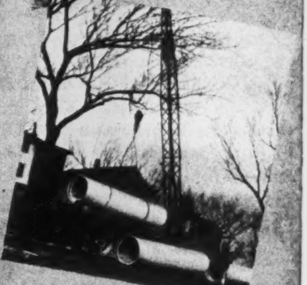

NORFOLK, VA.

TULSA, OKLA.


DENVER, COLO.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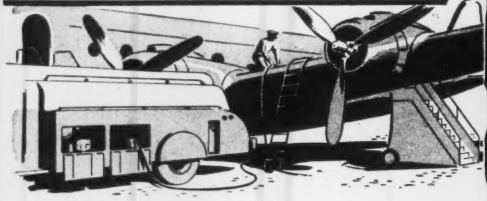

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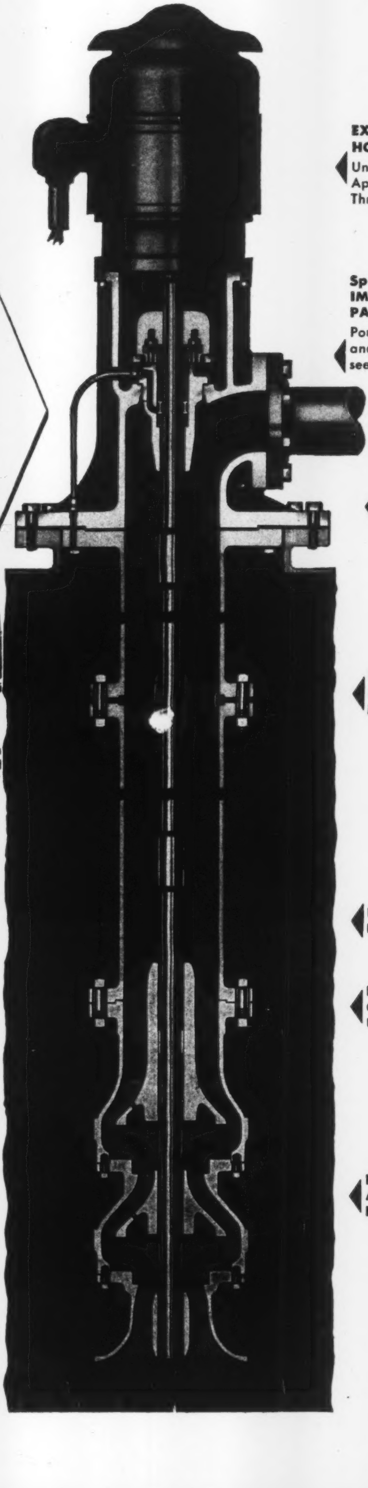

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**ENCLOSED IMPELLERS ASSURE MAXIMUM EFFICIENCY**

(*Continued from page 178*)

At Parkmerced in San Francisco, 1,796 apartments in 11 buildings, each 13 stories high, are being added to the 1,687 prewar apartments already in use. All buildings have reinforced concrete frames and walls.

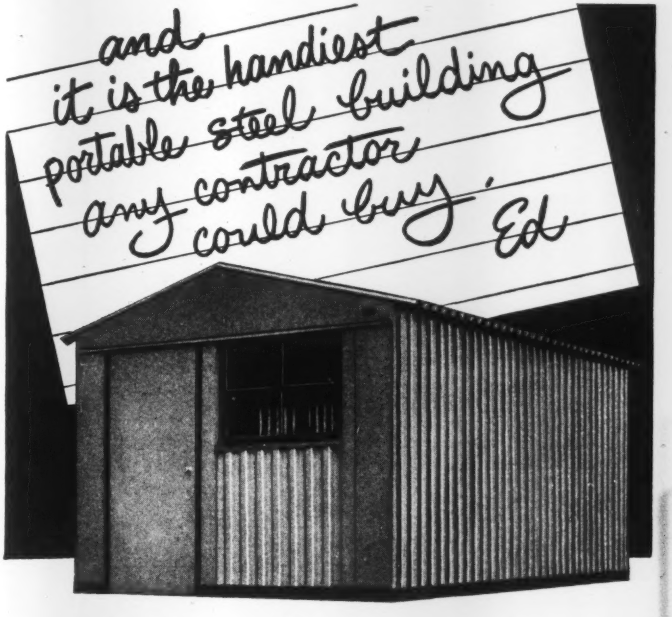
• **Mutual Life Insurance Co.**—This company's office building in New York City has been completed. It is 25 stories high, contains 575,000 sq ft of floor area, has a structural steel frame and limestone exterior, and is air conditioned. It cost about $12,000,000.

• **New York City Board of Education**—During 1950, 11 elementary schools for 11,400 pupils, were placed under construction, at a cost of $15,468,000, exclusive of furnishings. Also, a $2,400,000 junior high school for 2,000 pupils was started. At the same time, work continued on the 12 elementary schools for 14,370 pupils, costing $19,175,000, and 3 junior high schools for 5,450 pupils, costing $7,530,000, that were placed under contract in 1949.

• **New York City Housing Authority**—Completed in 1950: Albany, Eastchester, Sheepshead Bay, Pelham Parkway, Todt Hill, Glenwood, Berry, South Beach, Nostrand, Paterson, Gun Hill and the first section of Smith Houses are structural steel; all other projects under way in 1950 1950: Breukelen, Flushing, Pomonok, St. Nicholas, Foster, Edenwald, Throgg's Neck and the second sections of Astoria and Smith Houses, for 11,476 apartments, which will cost $144,200,000. Structural frames of Smith Houses are structural steel; all other projects under way in 1950 have reinforced concrete frames. Brick cavity-wall construction is used in the Boulevard, Pelham Parkway, Dyckman and Gun Hill Houses; all others have solid brick walls.

• **100 Park Ave.**—This 36-story, steel-frame, air-conditioned office building in New York City now is occupied. It contains about 10,200,000 cu ft of space and 800,000 sq ft of floor area. Except for the windows, brick piers and granite base, the entire front is of aluminum. Cost was about $15,000,000.

• **Onondaga County War Memorial**—This memorial, which cost about $3,500,000 to construct, is a multi-purpose structure; it can be used for sporting events, conventions, opera or theater, accommodating from 2,000 to 9,000 people in the main auditorium. The building, 242x334 ft in plan, consists of three reinforced con-



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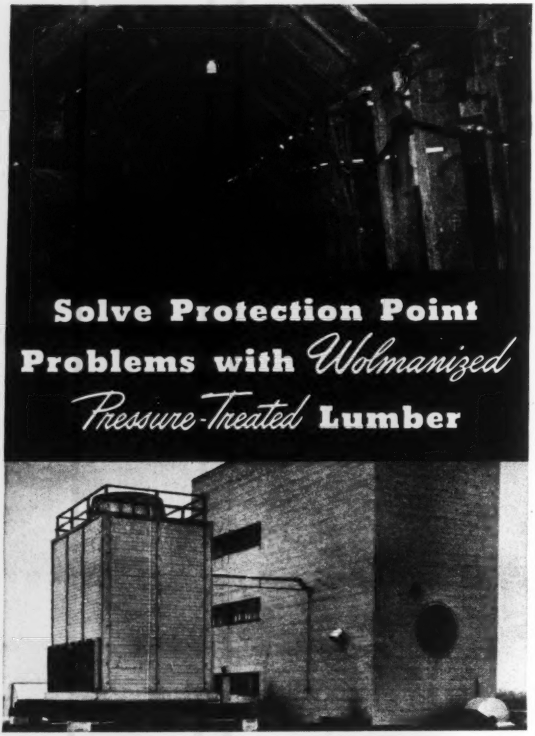

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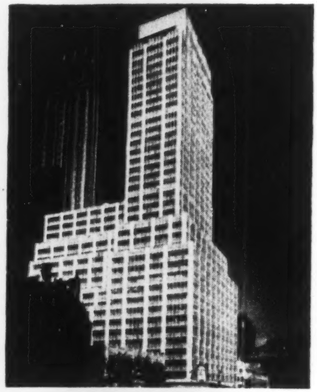


100 Park Ave., 36-story high office building in New York City, has aluminum spandrels. (Kahn & Jacobs photo.)

crete structures—a memorial hall, a stagehouse and the main auditorium. The auditorium has a thin-shell arched roof, with a clear span of 204 ft, supported at the edges 37 ft above the main floor on cantilevers about 25 ft long.

• **Pacific Gas & Electric Co.**—Moss Landing and Contra Costa plants will each have a capacity of 500,000 kw. The $81,000,000 Moss Landing plant was started in 1948 and the first 100,000-kw unit went into operation in April, 1950. Two 100,000-kw units will be added in 1951 and two more in 1952. The Contra Costa plant was started in 1949. First units will be in operation in 1951, with plant completion scheduled for 1953. Both plants will have oil storage totalling 720,000 bbl.

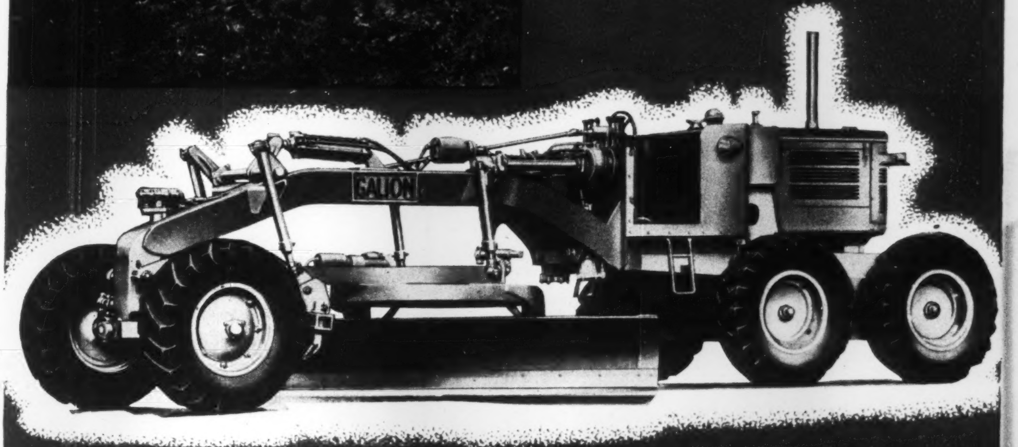
• **Port of New York Authority**—A $24,000,000 bus terminal in New York City has been completed, thus enabling 2,400 buses to keep off midtown streets. Of steel frame construction, with brick exterior, the building has a 3-acre parking area on the roof. Ramps leading to upper floors and roof are radiant heated to melt snow and ice.

At New York International Airport, three steel arch hangars, each 300x 219 ft in plan, were finished last summer, at a cost of $9,000,000, including utilities and paving. A two-story concrete-and-brick operations-cargo building, started in March, was substantially completed by the year's end. It cost $1,900,000. And foundations were placed for a 150-ft high control tower.

At Port Newark, two cargo terminal buildings were finished last

(*Continued on p. 186*)

# *Put a* GALION GRADER *on the Job!*



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# These Concrete Project Case Histories Prove the Advantages of PLYWOOD FORMS

**1. Smooth, Fin-Free Concrete**

**2. Multiple Re-Use**

**3. Time and Labor Savings**

**4. Design Adaptability**

### 1. Smooth, Fin-Free Concrete

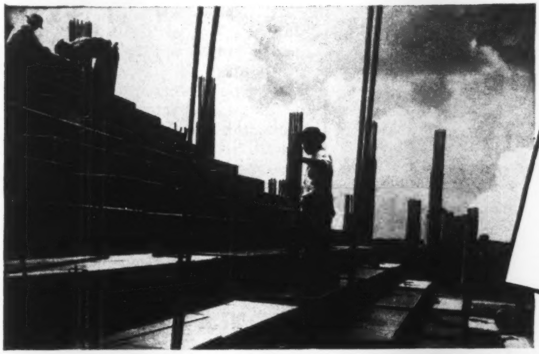
Almost three million square feet of plywood forms were used to form mirror-smooth concrete surfaces on the huge Parklabrea Housing Project, Los Angeles. So smooth were ceiling slabs that the concrete was merely painted and left exposed. Architects report: "We consider the results amazing." Architects on the project: Leonard Shultz and Associates, New York, represented in Los Angeles by Gordon Kaufman & J. E. Stanton. General contractors: Starret Bros. & Eken, New York.

GIANT APARTMENT DEVELOPMENT, industrial building or heavy construction project—Douglas fir plywood is ideal for *every* type of concrete form work. Versatile and adaptable, plywood forms create smooth, clean, monolithic surfaces . . . speed work . . . contribute to overall job economy through simplified form construction, labor savings and panel re-use. Highly moisture-resistant glues used in PlyForm®—the special concrete form grade of Interior-type plywood—permit multiple panel re-use (as many as 10 to 15 are not unusual). For greatest possible re-use, however, specify EXT-DFPA • CONCRETE FORM® bonded with completely waterproof adhesives which permit panel re-use until the wood itself is literally worn away. For the finest possible concrete surfaces, panels having "A" face veneer, or one of the new plastic faced panels may be used.

*® Ply-Form and EXT-DFPA® are registered grade-trademarks of Douglas Fir Plywood Association (DFPA).*

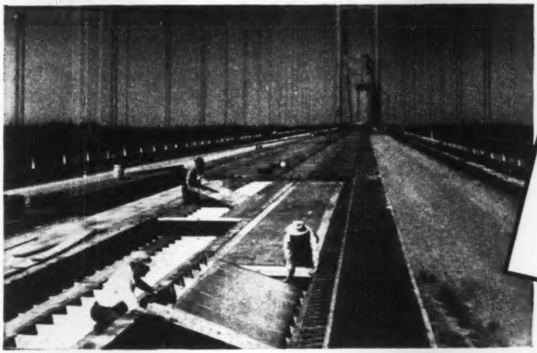
**Douglas Fir Plywood**

**AMERICA'S**



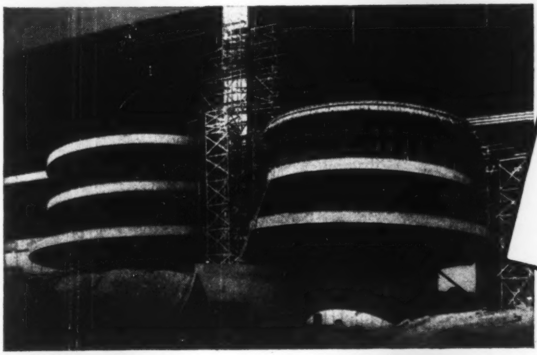
## 2. Multiple Re-Use

"We've found plywood forms to be the most economical for several reasons," says C. J. Rollo, job superintendent for Brown & Root, Inc., contractors for the new Rice Institute Stadium, Houston. "Given proper care, they can be re-used again and again; they're easier to handle, produce better looking concrete." On the job, built-up PlyForm seat forms were still in good condition after up to ten re-uses. An even greater number of re-uses was recorded for PlyForm wall and fence forms. Architects: Floyd & Morgan and Milton McGinty.



## 3. Time and Labor Savings

"Plywood speeded form work all along the line," says Earl Starbard, job superintendent of Woodworth & Co., contractors for all concrete work on the new mile-long Tacoma Narrows Bridge. On the job, contractors report, use of built-up plywood form sections "cut time and labor costs by 15%." Plywood forms were used to form the reinforced concrete roadway and for all aboveground concrete on the anchors, toll houses, bents and viaduct. Built by Washington State Bridge Authority; Charles E. Andrew, chairman and principal engineer.



## 4. Design Adaptability

Plywood forms were called on to solve an unusually intricate concrete job in building the spectacular twin-spiral ramps at the University of Washington grid bowl addition. "Plywood forms offered the simplest and least expensive solution," reports Elmer Strand, partner of Strand and Son, General Contractors, Seattle, Wash. "The panels can be re-used many times. They're easy to fabricate into cost-cutting built-up form sections and are easily bent to form curved surfaces." Architects: George W. Stoddard and Associates, Seattle.

## Large, Light, Strong Real Wood Panels

For additional data on Douglas fir plywood for concrete form work, write Douglas Fir Plywood Association, Tacoma 2, Wash. Use coupon at right to obtain your free copies of two plywood form booklets: "Concrete Forms of Douglas Fir Plywood" and "Handling PlyForm." Also available is the new Keely PlyForm Calculator. This handy slide rule gives construction data for plywood forms based on hourly rate of pour. Price (including leaflet, "Design Assumptions For New Keely Calculator"): $1.00.

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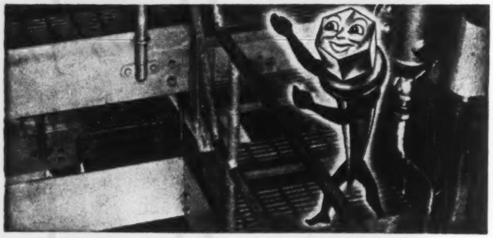

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(Continued from p. 182)

May, at a cost of $2,500,000. They provide more than 182,000 sq ft of storage area. In July, an $8,300,000 motor truck terminal was completed in Newark. Accommodating 160 trucks, the building is 1,174 ft long and 202 ft wide. Late last year, plans were approved for construction of a $6,000,000 passenger terminal building, containing 150,000 sq ft of floor area, at Newark airport.

• **Republic National Bank of Dallas**—This air-conditioned, 36-story office building in Dallas, Texas, will have five floors devoted to banking and as a special service, a drive-in motor bank. In addition to the banking areas, there will be 260,000 sq ft of office space. A parking garage will occupy the 3-floor basement, which covers the entire one-acre plot. The building contains 10,000,000 cu ft of space. It has a structural steel frame exterior of aluminum and glass.

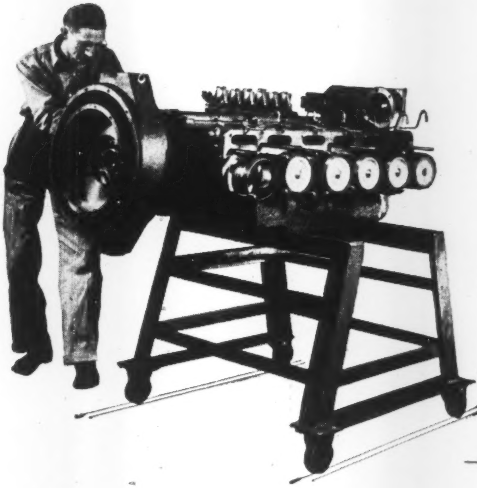
• **Sinclair Oil Building**—This 26-story, steel-frame, limestone-faced building was the first in New York City to have steel-deck floors and perlite-plaster fireproofing. Air conditioning will be accomplished with absorption-type refrigerators. Costing about $8,000,000, it is expected to be ready for occupancy in May.

• **Statler Hotel**—Steel is up for this $23,000,000 building in downtown Los Angeles, and work is ahead of schedule. Completion is expected by June, 1952. The hotel will have 1,275 rooms. At the front will be a 13-story office building.

• **Stonestown**—The ten 3-story buildings and four 10-story buildings com-

Tall brick building is typical of New York City Housing Authority projects.

# Cummins® Custom-built Diesels



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Rugged, lightweight, high-speed Cummins Diesels perform better because they're built better, under strictest quality control methods. Moreover, each engine is actually built twice! After initial assembly, each engine is run in on the test block. Then it is torn down and carefully re-inspected—and after that it is re-assembled and tested *again.*

Such *extra* care in precision building . . . Cummins exclusive fuel system . . . reliable world-wide service and parts organization . . . enable Cummins users to get peak performance . . . less "down-time" and *more* rugged, dependable power.

Better contact your Cummins dealer. He has more facts to show you about making more profits.

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TRADEMARK REG. U.S. PAT. OFF.

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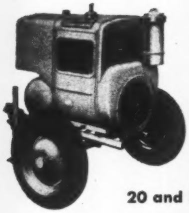
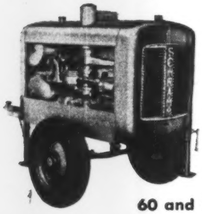
Columbus, Indiana, U. S. A. • Cable: Cumdiex

Lightweight High-speed Diesel Engines (50-550 hp) for: On-highway trucks • off-highway trucks • buses • tractors • earthmovers • shovels • cranes • industrial locomotives • air compressors logging yarders and loaders • drilling rigs • centrifugal pumps generator sets and power units • work boats and pleasure craft.

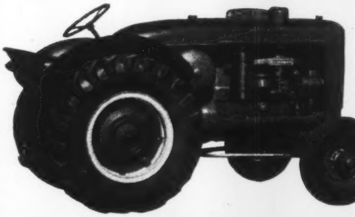
# from the ground up–



20 and 35



60 and 105
*Pneumapower*



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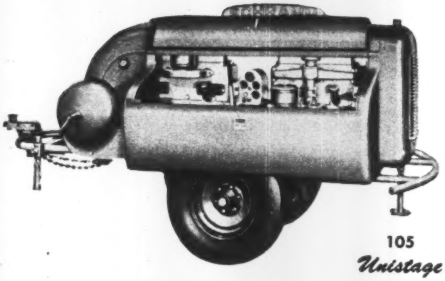

105
*Unistage*

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210, 315 and 600
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**SCHRAMM INC.**
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WEST CHESTER • PENNSYLVANIA

(*Continued from page 186*)

prising this San Francisco apartment development have been completed. They provide 683 units (estimated cost: $8,000,000). Construction of an adjoining $15,000,000 shopping center is now under way.

• **TVA Steam Power Plans**—Steam power to increase and firm up Tennessee Valley Authority output forged ahead in '50, as provisions were made for the fifth and sixth 112,500-kw units at Johnsonville, Tenn., and for two similar units at Widows Creek plant near Stevenson, Ala. Early this year, Congress appropriated money for two more fuel plants needed to produce power for atomic-energy works: one of the Tennessee River near Kingston, Tenn., and one of the Ohio River near Paducah, Ky. Each will have four 135,000-kw units.

• **United Nations**—The 39-story Secretariat in New York City has been completed. It is 287 ft long, 72 ft wide and about 500 ft high. It has a structural steel frame, faced on the north and south ends with marble and on the east and west with aluminum and heat-resistant glass. Completely air conditioned, it contains 500,000 sq ft of floor area. Underground parking garages have been completed, as have the foundations for the Meeting Halls and General Assembly Buildings. A $12,000,000 contract for the superstructure of the Meetings Hall Building was awarded last February, with completion scheduled for 1951.

• **U.S. Public Buildings Service**—Among the large buildings that this branch of the General Services Administration had under construction in 1950 are: $22,000,000 General Accounting Office, in Washington, D. C., originally scheduled for October completion, now being considered for July 1 occupancy; $9,400,000 Federal Courts Building, District of Columbia, to be finished Jan. 1; and Clinical Center Building, National Institute of Health, in Bethesda, Md., to be completed in June, 1952, for which a $3,273,000 substructure contract and a $16,814,200 superstructure contract have been awarded.

• **U. S. Steel Corp. Subsidiaries**—To meet substantial increases in demand for steel, improvements and additions are being made to existing facilities. In the Pittsburgh and Chicago districts, annual steel-making capacity will be increased 1,660,000 ingot tons. At Birmingham, Ala., 500,000 tons will be added to the annual capacity. And a new steel mill of about 1,800,-

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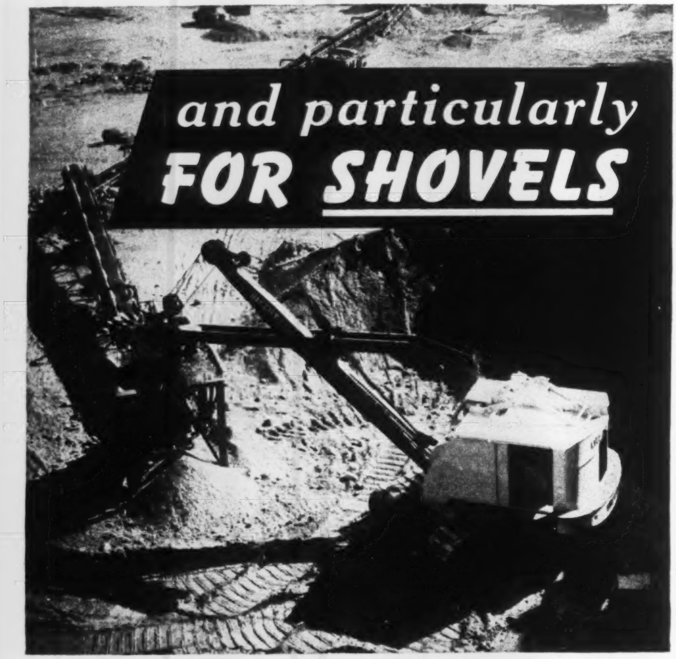
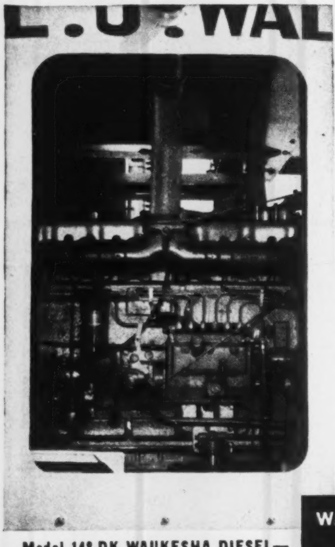


WAUKESHA
*Diesel* POWER



**Model 148-DK WAUKESHA DIESEL—** six cylinders, 5¼-in. x 6-in., 779 cu. in. displ.

• Into each shovel's life comes work that is rough and hard. And the shovel's engine has to take it, too. Putting out a lot of raw, rugged power isn't enough in itself. That power must be slick and smooth—and quick—right there the instant the operator demands it. And that's what makes Waukesha Diesels unique — their snappy fast recovery. You get more loads per minute using Waukesha Diesels.

The shovel you're watching here is working for Lyle J. Walker, a sand and gravel plant operator, at New Hudson, Mich. It's a Model 65 Bay City Shovel with a 25-ft. boom, 20-ft. dipper sticks, and a 1¼ cu. yd. dipper—powered by a Model 148-DK Waukesha Diesel.

Mr. Walker operates five additional Waukesha-powered shovels — Model 45 Bay City Shovels with Model 6-SRKR Waukesha gasoline engines.

Get Waukesha Diesel details in Bulletin 1532.

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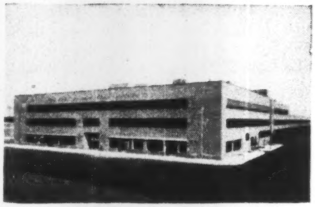

**Truck terminal was completed by the Port of New York Authority in Newark, N. J.**

000-ton capacity is being constructed near Morrisville, Pa.

At McKeesport, Pa., a new mill was completed last April. It is capable of turning out annually 100,000 tons of electric welded and hydraulically expanded steel pipe, ranging up to 36 in. in diameter.

Improvements at the Chicago and Gary, Ind., plants will increase the tin-plate producing capacity 120,000 tons annually at Gary. In addition, construction at Pittsburgh, Calif., will result in an annual increase of 215,000 tons in cold-reduced sheet and tin plate production. And at Geneva, Utah, additional facilities are being built to add 100,000 tons of hot-rolled sheets annually.

• **University of California** – Under construction at present are projects that will cost $51,300,000. Largest of these is the medical center in San Francisco, for which an $8,000,000 contract has been let. During 1950, construction was completed on $8,840,000 worth of buildings. Bids will probably be taken this year for $46,300,000 in buildings.

• **Veterans Administration**–At the end of 1950, the VA had completed 27 hospitals, providing 14,233 beds. Also, 35 additions, containing 12,200 beds, were finished. Still under construction were 31 hospitals, with 16,955 beds, and four additions, with 1,510 beds.

• **White House** – Reconstruction is scheduled for completion next October. Congress has appropriated $5,400,000 for the job.

• **Wilshire Blvd Office Buildings** – Three 12-story air-conditioned office buildings are being erected in Los Angeles at an estimated cost of $12,000,000. The steel frame of the first has been finished, and steel erection is starting for the others, with completion of the project scheduled for October. Occupying a frontage of 465 ft on Wilshire Blvd., the structures are connected only at street level; each building stands on a separate 100x150-ft plot.

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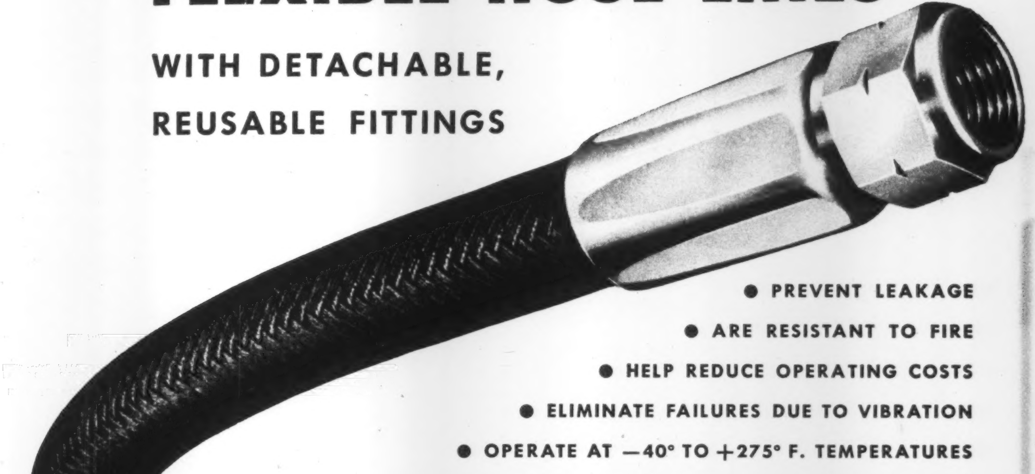

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# Water use and control

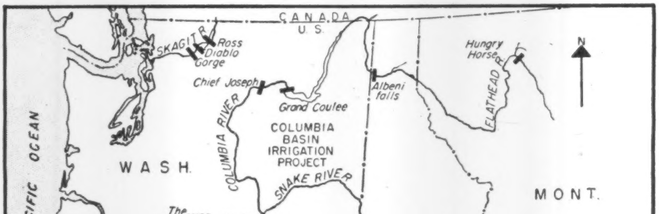
- **Central Florida**—Work on the first phase of the Central and Southern Florida Flood Control Project has been under way since early in 1950. The entire project is estimated to cost $208 million. Congress has appropriated $36,300,000 toward the federal share of the work now under way, which is estimated at $68,387,000. Current work is chiefly construction of levees to protect land from flooding or to form storage basins, enlargement of existing canals, construction of some new channels, and some control structures. Work on 6.3 miles of levees has been completed; work on 16.2 more miles is nearing completion, and 7.9 miles more are under contract. Bids on 88.3 more miles will be received this year. Enlargement of parallel canals is included in some of this levee work. One canal 5.4 miles long has been completed. Bids on 48 more miles are to be received this year.

- **Southeastern States** – Finishing touches were put on $31,500,000 **Allatoona Dam** east of Rome, Ga., during 1950. This Etowah River flood-control and power project has a 389,000-acre-ft flood control capacity and a 74,000-kw initial power capacity. It is the first step in a comprehensive plan for the Alabama-Coosa river system.

On the confluence of the Flint and Chattahoochee rivers, where they become the Appalachicola at the Florida-Georgia line. **Jim Woodruff Lock and Dam** were advanced from 11 to 22% of completion during last year. The lock and fixed crest spillway of the $42,208,000 project are to be finished this year, according to the Corps of Engineers. Due to start this year is work on the second stage cofferdam, the gated spillway and the 30,000-kw power plant. The 6,130-ft long dam will create a 33-ft head. The lock will be 82x450 ft.

Second project to be started by the Corps in the Appalachicola Basin is $40,225,000 **Buford Dam,** just under way on the Chattahoochee 35 mi northeast of Atlanta, Ga. Here, 5,100,000 cu yd of earth will rise 192 ft above the river bed to control floods and furnish 86,000 kw of power capacity. The 100-ft long spillway and one of three saddle dikes are finished, and bids will be taken this year on the other dikes plus forebay, tunnel and tailrace excavation.

On the Tombigbee River 218 miles above Mobile in Alabama, **Demopolis Lock and Dam** were under construction by the Corps of Engineers throughout 1950. The $20,834,000 project, now 5% completed, will have a 110x600-ft lock with a 40-ft lift and will replace four existing locks on the river system. The concrete gravity dam will have a fixed crest spillway



THE PACIFIC NORTHWEST continues to be a beehive of river development activity as both the Corps of Engineers and the Bureau of Reclamation push big multipurpose projects. See p. 224.

# DRY DIGGING?.....
# THIS PICTURE SPEAKS FOR ITSELF!

*We add a few interesting facts:*

1. This is the Berkley approach to the Elizabeth River Tunnel, part of the $18,000,000 tunnel-bridge project between Norfolk and Portsmouth, Va., on which Merritt-Chapman & Scott Corp., New York, and Tidewater Construction Corp., Norfolk are joint contractors.
2. Both firms, working on separate sections, are using Moretrench Wellpoint Equipment for quick dry results and economical progress.
3. On the section shown above a MORETRENCH WELLPOINT SYSTEM controls approximately 40 feet of water in sand and clay — eliminating sheeting.

Expert planning, superior equipment, years of know-how stand in back of every Moretrench job. That's why experienced contractors depend on it, again and again, for excavating "in the dry".

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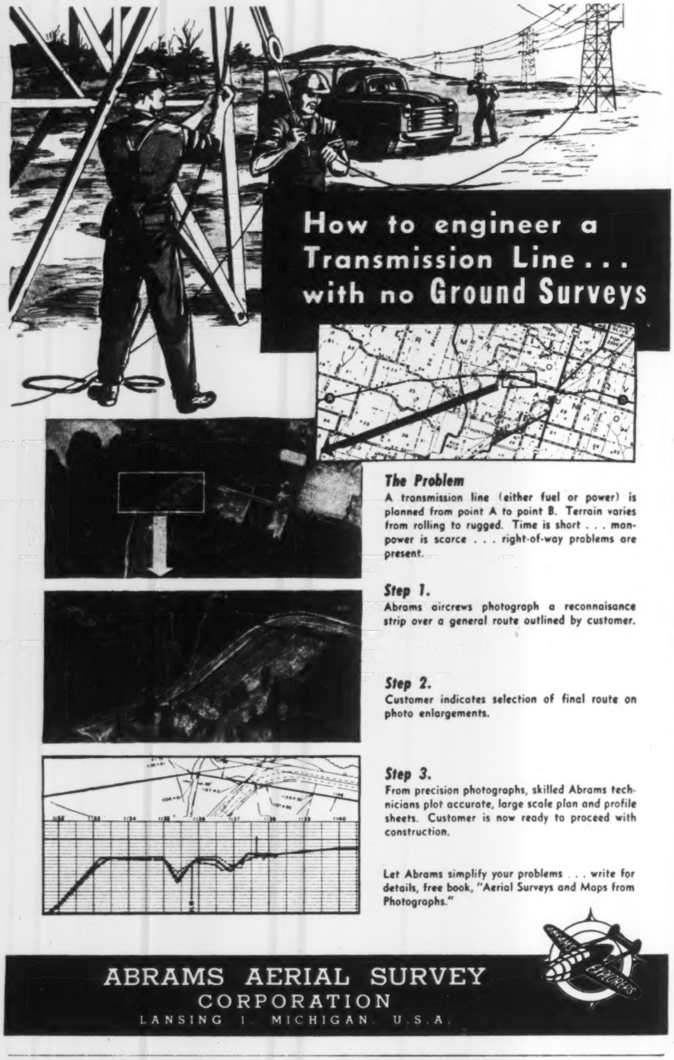

How to engineer a Transmission Line . . . with no Ground Surveys

**The Problem**
A transmission line (either fuel or power) is planned from point A to point B. Terrain varies from rolling to rugged. Time is short . . . manpower is scarce . . . right-of-way problems are present.

**Step 1.**
Abrams aircrews photograph a reconnaisance strip over a general route outlined by customer.

**Step 2.**
Customer indicates selection of final route on photo enlargements.

**Step 3.**
From precision photographs, skilled Abrams technicians plot accurate, large scale plan and profile sheets. Customer is now ready to proceed with construction.

Let Abrams simplify your problems . . . write for details, free book, "Aerial Surveys and Maps from Photographs."

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LOCATE HIDDEN VALVE BOXES, surveyor's stakes, manhole covers, septic tanks...
with the "AQUA VALVE BOX LOCATOR"
....quickly, easily, cheaply!

$29.50
F.O.B. CIN., O.
with fine leather case

Thousands are used by Water Dept. and Gas Co. men and surveyors. Instant top-view periscope reading. Rubber-mounted cobalt steel dipping needle guaranteed for ten years. Accurate in ice and snow in all terrain. Also serves as a rugged accurate compass.

Time and trouble saved in finding just one valve box could pay for it. Send for complete illustrated description. Ask about 15 day FREE TRIAL.

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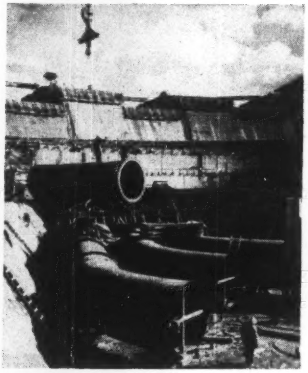
which is to be 1,485 ft. in length.

At $78,400,000 **Clark Hill Dam** on the Savannah River above Augusta, Ga., closure has been completed; the entire river now flows through eight sluiceways in the dam; the powerhouse contract is let and getting under way. The dam is due to be completed next January. All seven 40,000-kw power units are to go in initially. The project is strategically close by AEC's new installation in South Carolina.) The dam is 200 ft high, 5,680 ft long including 2,282 ft of concrete spillway and powerhouse intake sections. There are to be 1,050,000 cu yd of concrete in the structure. The job is nearly 70% finished.

In the Yazoo River Basin in Mississippi, embankment and concrete spillway construction at **Enid Dam** on the Yocona River was finished last year. Construction of the outlet structure and the closure section of the 8,400-ft rolled fill embankment will be finished by this December, and the entire project completed early next year. Earth-fill embankment and concrete spillway construction at **Grenada Dam** on the Yalobusha River was completed last year for $8,900,000. Highway relocations costing $3,600,000 are 18% finished, while a $1,500,000 railroad relocation is virtually completed. Contracts totaling $4,000,000 will be awarded this spring for construction of the embankment closure sections and outlet works; also $700,000 for a highway relocation. The project is scheduled for completion in 1954.

•**Tennessee Valley**—TVA entered 1950 with an installed capacity of 2,882,610 kw—including 36,000 kw of Cumberland River power it didn't produce, but did market. By year's end that total had hit 3,045,610 kw, and **South Holston Dam's** 35,000 kw has been added since. Units put on the line in '50 were at **Wilson, Wheeler** and **Wilbur** dams. Last July, construction started on **Boone Dam**, a 1,300x140-ft concrete gravity structure to control South Fork Holston River above Kingsport, Tenn. It's due to have three 25,000-kw units on line by late 1952. TVA aims to add 321,800 kw of hydro, 225,000 kw of steam power in 1951, then increase its total capacity to 5,000,000 kw in '52.

• **Roanoke Basin—Buggs Island Dam** on the Roanoke, just above the N. C.—Va. line, is a $78,870,000 flood control and power project of the Corps of Engineers. Its 2,785-ft long concrete section is 80% complete and will mount twenty-two 42x32-ft tainter gates when finished. Dam height is 144 ft. Construction has started on the powerhouse superstructure, where-



Penstocks for Hungry Horse Dam are pushed as big project rises in Montana.

in seven units will total 204,000-kw capacity when installed. Reservoir clearing is half done, and a Southern Ry. relocation upstream is over 50% completed. Earth wing and saddle dikes totalling 19,600 ft in length are still to be built.

Only other Roanoke Basin project authorized for construction by the Corps is $13,000,000 **Philpott Dam,** now 65% finished on the Smith River 34 miles south of Roanoke. The 920-ft long, 219-ft high gravity concrete structure is to control this small, but treacherous stream well up in the watershed. A fire in January caused damage to concrete plant controls that may set the job as much as 90 days behind schedule.

- **New England–Mansfield Hollow Dam** on the Natchaug River near Willimantic, Conn., was pushed from 8 to 76% of completion during 1950. It is a $3,300,000 earthffill structure 12,500 ft long.

- **New York State**–Last year the Corps of Engineers pushed **Mt. Morris Dam** to 78% of completion on the Genessee River; it should be substantially completed this year. The $25,000,000 flood control (only) project comprises a 1,026-ft long concrete gravity dam with uncontrolled overflow spillway 200 ft high above the spilling basin and 550-ft long. The Lake-Ontario-bound river will form a 17-mile long lake and discharge through nine 5x7-ft sluices at full pool.

- **Ohio River Basin**–Construction contracts for river and harbor and flood-control works in the Ohio River Basin totaling $30,600,000 were awarded last year by the Corps of Engineers, and work costing $33,000,000 was completed. An estimated

(*Continued on p. 198*)

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Compare Heltzel forms with any other. Point for point Heltzel forms are outstanding in construction features and on-the-job advantages. Like all good equipment, they afford economies in working time while assuring a better job.

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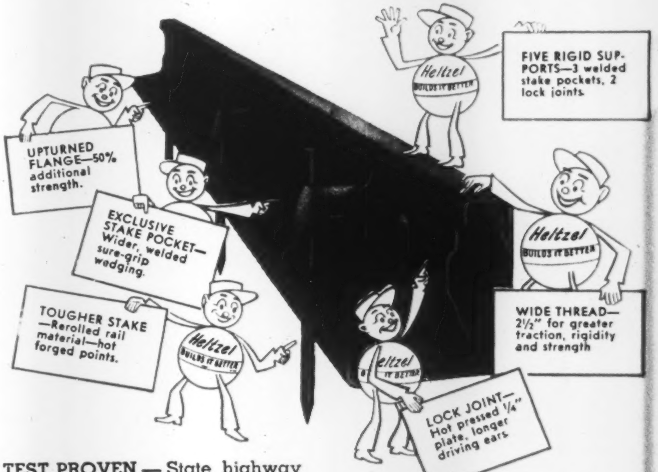
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TOUGHER STAKE—Rerolled rail material—hot forged points.
FIVE RIGID SUPPORTS—3 welded stake pockets, 2 lock joints.
WIDE THREAD—2½" for greater traction, rigidity and strength
LOCK JOINT—Hot pressed ¼" plate, longer driving ears
Heltzel BUILDS IT BETTER

**TEST PROVEN** — State highway tests show Heltzel builds better forms. Average results prove Heltzel 20% better.

**JOB PROVEN** — Veteran Heltzel forms can be seen on many jobs — they last longer. They don't wiggle and weave under pressure and movement of heavy equipment — they stake firmly and carry the load.

HELTZEL **DUAL DUTY** FORMS

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Each dual duty form can be used to make two thicknesses of concrete slabs. Illustration above shows same form in upright position for 24" slab and side position for 20" slab. Sizes from 8" up.

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# Milwaukee Adds

# ...*Does NOT Add*

ALTHOUGH IT BOOSTED pumping capacity 3 times, floor space requirements of this new centrifugal pump were no greater than the old reciprocating pump it replaced. Cubic space requirements, including turbine, condenser and auxiliaries, were actually many times *less*.

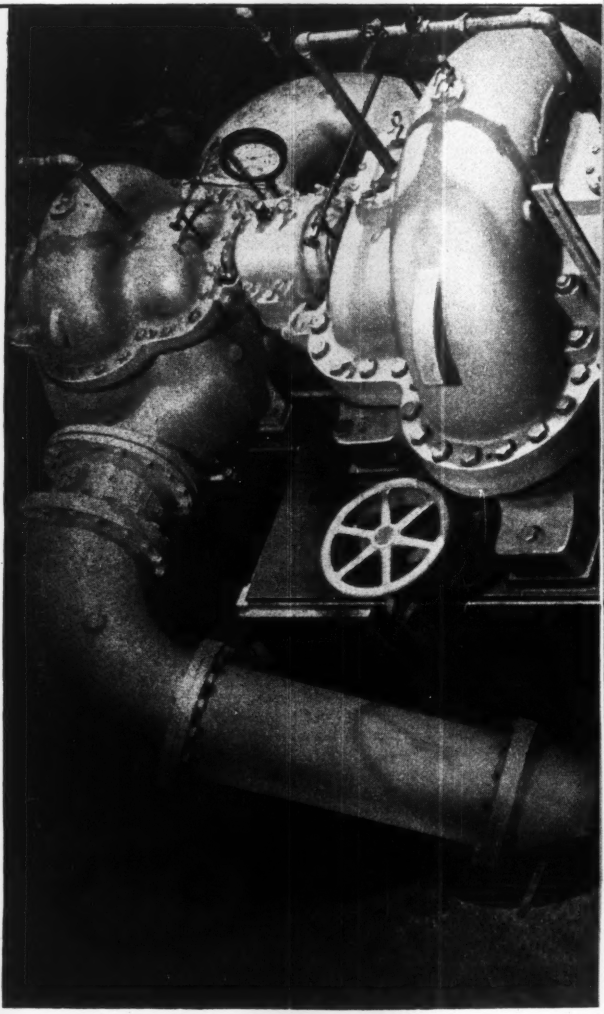
This installation — at Milwaukee's Riverside pumping station — makes an interesting comparison. It points up the progress that has been made in municipal water handling in the last 25 years.

Compactness of modern centrifugal pumps permits you to increase capacity several times in stations now equipped with reciprocating pumps, without costly additions to building space. You have the same comparative advantage in building a new, smaller pumping station.

## ALLIS-CHALMERS PUMPS SELECTED

There's another fact worth noting about this installation. When Milwaukee municipal engineers made plans to increase pumping capacity, they turned to Allis-Chalmers for their pumps, turbine and condenser. Like experts of other cities, they knew they could count on Allis-Chalmers for a well engineered, thorough job. More than 90% of Milwaukee's municipal pumps are Allis-Chalmers built, some installations dating as far back as 1873.

When you plan expansion or modernization of your pumping facilities, follow the example of Milwaukee and other progressive cities. Call in your A-C representative early in your planning stages. For literature, write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for bulletin 52B6059G. A-3310

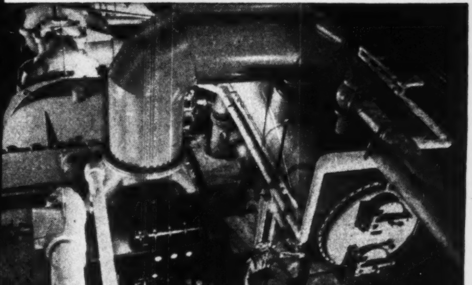


SHOWN ARE the two pumps in series rated 60 MGD, that replaced the old 20 MGD reciprocating unit. Smaller pump at far left is the condenser circulating pump.

A-C ALLIS-CHALMERS

**ALLIS-CHALMERS**

# 40 MGD
# *Space*



**DRIVING THE NEW PUMP** is this Allis-Chalmers turbine (foreground) rated 3700 hp. Allis-Chalmers condenser, just to the right, completes the team. Ability to furnish the world's widest range of municipal pumps and auxiliary equipment is an important advantage you gain from Allis-Chalmers.

**IN THE FOREGROUND** is the 25 year old, 3 story high reciprocating pump that was replaced. A bank of these "old faithfuls," installed by Allis-Chalmers 25 years ago, is gradually being replaced by new, compact and more efficient centrifugal pumps.

Truly Versatile..
AN OWEN BUCKET
Rapid excavation in all types of soils with "A" Mouthful at Every Bite."
Owens "lend a hand" in tearing down as well as cleaning up on demolition jobs.
Tremendous closing power is graphically illustrated in this rock handling operation.
Even steel girders cannot escape the firm grasp of an "Owen."
Old tires by the dozens are handled with ease by versatile "Owens."
"A mouthful at every bite"

More than just buckets, "Owens" are Versatile Tools, earning their way, every day on jobs of widely varying nature.

Sound principles of design and rugged construction are paying dividends to Owen owners everywhere. Write for the catalog.

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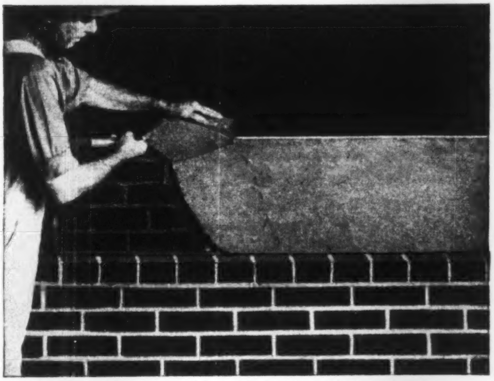
CHAIN OF ROCKS—Lock 27 on the canal by-passing the Mississippi's treacherous stretch above St. Louis.

$44,400,000 worth of contracts will be awarded this year—all directly related to the defense effort—for power, essential navigation facilities and flood protection of vital areas. Construction on five reservoir projects and ten local protection works is being curtailed in the interest of lessening the demand upon manpower and materials needed in the defense effort. Major projects completed last year include: $6,700,000 **Dewey Reservoir** in Kentucky to impound 77,000 acre-ft of water for flood control and 11,000 acre-ft for conservation; $8,000,000 **Delaware Reservoir** in Ohio, storing 123,600 acre-ft for flood control and 8,400 acre-ft for conservation; $24,200,000 of local flood protection works for **Cannelton** and **Muncie, Ind., Portsmouth, Ohio, Latrobe** and **Punxsutawney, Pa.,** and **Parkersburg, W. Va.**

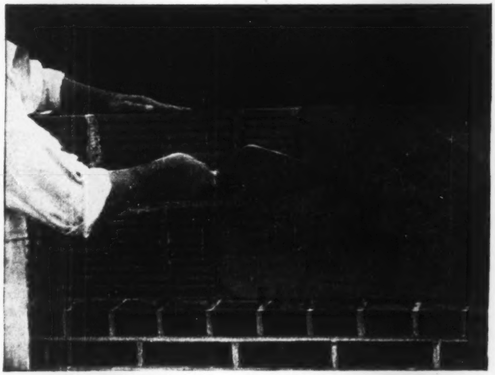
Three flood-control reservoirs now are under construction in the basin. **Conemaugh Reservoir** in Pennsylvania, 60% finished at year's end, is expected to be completed in 1953-54 at a cost of $47,500,000. Contracts totaling $4,000,000 will be awarded this year and closure of the dam will be made this December. The $6,000,000 **Cagles Mill Reservoir** in Indiana is 56% finished. This year $800,000 of highway and utilities relocation will be awarded, with completion of the entire project scheduled for June 1952.

**Center Hill Reservoir** in Tennessee will be completed this October at a cost of $45,700,000. It will provide 1,600,000 acre-ft of water for flood control and conservation, and will generate 135,000 kw of capacity. **Wolf Creek Reservoir** in Kentucky was 76%

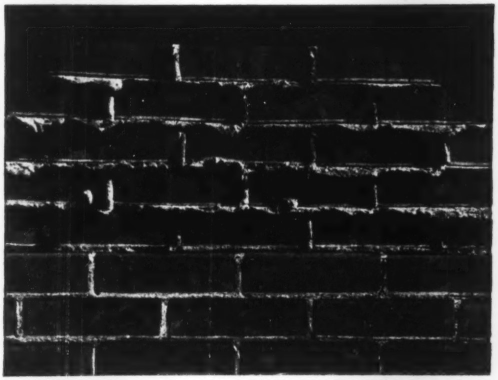
**GOOD BRICKWORK = GOOD DESIGN + GOOD WORKMANSHIP + GOOD MATERIALS**



*The face brick should be backplastered.*



*If the back-up units are laid first, the front of the back-up units should be plastered.*



*Backplastering should not be attempted over protruding mortar joints.*

# PARGING

## WITH

# BRIXMENT

## HELPS ASSURE

# DRY WALLS

**WE SUGGEST THAT—**

**The face brick should be backplastered with not less than ⅜ of an inch of mortar before the back-up units are laid.**

**Or, if the back-up units are laid first, the front of the back-up units should be plastered with not less than ⅜ of an inch of mortar before the face brick are laid.**

Heavy rains don't make brick walls leak — they merely reveal the fact that the walls contain voids or passages through which the water may penetrate.

Dry brick walls are primarily the result of good design and good workmanship. Good materials are important, but still secondary. The more *plastic* the mortar used, the easier it is for the bricklayer to deliver good workmanship.

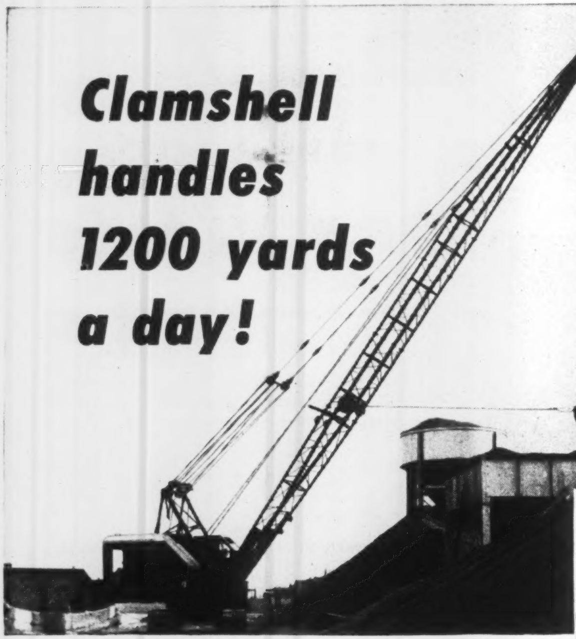
The photos at the left show some points of *good workmanship.*

*Brixment mortar has greater plasticity, higher water-retaining capacity and better bonding quality.* Because of this *combination* of advantages, architects, contractors and dealers all over America have for thirty years made Brixment the largest-selling mortar material on the market. Why not try it yourself?

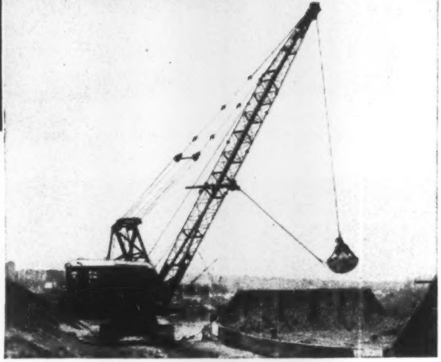
**LOUISVILLE CEMENT COMPANY, Incorporated, LOUISVILLE, KENTUCKY**

# OSGOOD

## Clamshell handles 1200 yards a day!



The capable OSGOOD shown above has helped Sol DeYorgi, Bronx, N. Y., through its outstanding ability to speed production and cut material handling costs. Used to unload barges and load hoppers for supplying material to cinder block plant, this powerful Clamshell unloads two barges—up to 1200 yards of sand and gravel in a day! Great maneuverability, dependability, and the velvet-smooth performance of the OSGOOD Air-Cushioned Clutch provide a peak of efficiency wherever OSGOOD Clamshells are in use.



*Barge to dock—an entire load of sand handled smoothly and quickly in just half a day by this OSGOOD Clamshell.*

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*AFFILIATED WITH THE GENERAL EXCAVATOR CO.*

POWER SHOVELS, CRANES
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DIESEL, GASOLINE OR
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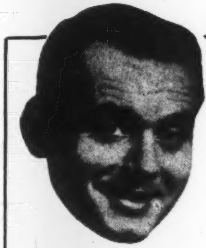
CAPACITIES 3/8 TO 2 1/2 CU. YD.

Huge siphon for Dry Coulee section of Columbia Basin job dwarfs workmen.

finished at the end of last year. The dam should be finished this September—the 270,000-kw power plant by May, 1953. This $82,700,000 project will store 3,950,000 acre-ft for flood control and water conservation.

Projects for improving river navigation on the Ohio system include: The **Morgantown Lock and Dam** on the Monongahela River in West Virginia, completed last December—five months ahead of schedule; reconstruction of **Lock No. 2** on the Monongahela River in Pennsylvania, now 47% finished, with $6,800,000 of construction contracts to be awarded this year. Project cost is $15,400,000; completion date is 1953. A 56x360-ft auxiliary lock is nearing completion, and bids for the 110x720-ft main lock will be received this spring. No construction contracts will be awarded this year on the $14,000,000 **Cheatham Lock and Dam** on the Cumberland River in Tennessee. Construction of the 110x800-ft lock was started last April and was 16% finished by the end of the year. Local protection projects include: the **Louisville, Ky.**, flood-protection project containing 12.8-mi of earth levee, 4.5 mi of concrete wall and 14 pumping stations. This $28,000,000 project, 40% finished at the end of last year, will be completed in fiscal 1954. An additional $3,100,000 of contracts will be awarded this year. Contracts totaling $6,600,000 also are expected to be awarded this year for the continuation of flood-protection construction for **Ashland and Maysville, Ky.**

• **Great Lakes**—Four generators having a total capacity of 18,500 kw will start operating this fall in the new hydroelectric power plant at **Sault Ste Marie, Mich.** The $10,750,000 plant



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PC GLASS BLOCKS,

your buildings look better, daylighting of work areas is improved, maintenance costs are reduced..."

● Specify PC Glass Blocks for any building and you add beauty, better daylighting in important work areas and *economy*. Yes, *real economy*. Because, PC Glass Blocks seldom require repairs or replacements. There's no metal or wood sash to rust, corrode, decay or warp; no necessity for periodic painting and puttying; no expensive cleaning of small, individual panes (normal rainfall and routine maintenance preserve their high light-transmittance). And, having more than twice the insulating value of ordinary single-glazed windows, panels of PC Glass Blocks reduce heating and air-conditioning costs; increase the efficiency of the air-conditioning system. Users report big savings . . . like the idea that a sash replacement program can be adapted to suit any budget—large or small. And they also like the PC Vision-Lighting Plan which permits use of orientation-keyed areas of *functional* Glass Blocks with vision-ventilation areas as required.

We'll be glad to consult with you on any problem dealing with your sash replacement needs. The coupon below will bring you further information on the use of PC Glass Blocks in all kinds of buildings.

A PRACTICAL example of how old sash is replaced with modern, handsome PC Glass Blocks is shown in this installation at the S. M. Frank & Co., Inc., building, Richmond Hill, New York. In manufacturing plants of all kinds such sash replacement programs improve operating conditions, reduce maintenance costs, eliminate periodic repairs and replacements.

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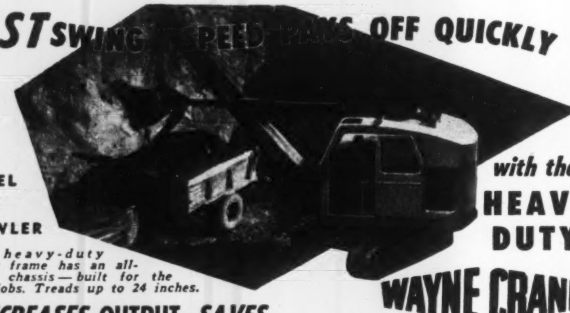

**MODEL 66 CRAWLER**

*This heavy-duty crawler frame has an all-welded chassis—built for the tough jobs. Treads up to 24 inches.*

with the HEAVY DUTY WAYNE CRANE

...INCREASES OUTPUT—SAVES TIME ON EVERY JOB

"ONE WAYNE CRANE SELLS ANOTHER"

One owner says, "Here is a ½-yd. shovel that moves more dirt than larger machines working on the same job." Others report the same because actually Wayne Crane has the fastest swing speed on the market—6½ r.p.m.

The Model 66 is a HEAVYWEIGHT in the ½-yd. class—31,978 lbs. as a shovel proves it—the extra weight is at points of greatest stress—this means more built-in hours of profitable operation.

You be the judge—don't buy a new crawler until you have compared Wayne Crane with any or all other ½-yd machines. See for yourself that Wayne Crane offers more machinery for your money!

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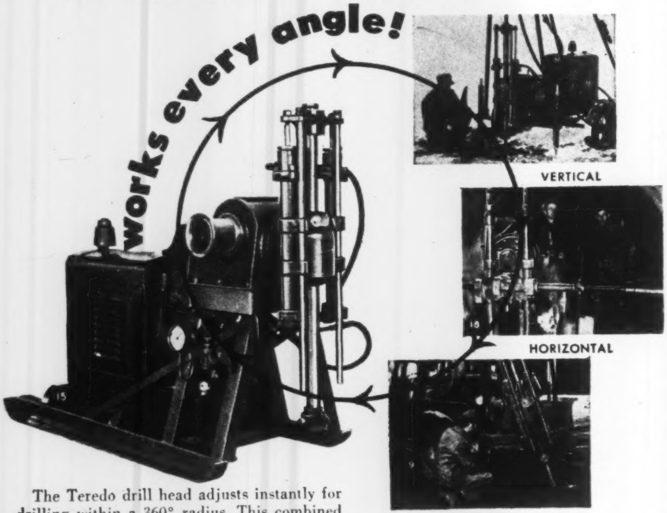


The Teredo drill head adjusts instantly for drilling within a 360° radius. This combined with other Acker features such as built-in pumps, cargo-type winches, hydraulic or screw feed heads, choice of power plant, mounting on drag or any type of vehicle, are bound to save time, labor and on-the-job costs.

*See for yourself—write for Bulletin 33, ENR*

*Over 30 years' experience in the design and development of Drilling Equipment.*

**ACKER DRILL CO., INC.**
SCRANTON 3, PA.

located in the **St. Marys Falls** rapids, adjacent to the Soo locks, was 69% finished at the end of last year. Other major projects of the Corps of Engineers, on the Great Lakes include: $1,000,000 **Clinton River** cut-off canal and control weir for flood protection of Mount Clemens, Mich., 77% completed; and $10,300,000 **Farm Creek** flood-control project for the protection of East Peoria, Ill., two thirds completed. Last year, $2,100,000 worth of contracts were finished, and an additional $2,800,000 is to be awarded this year.

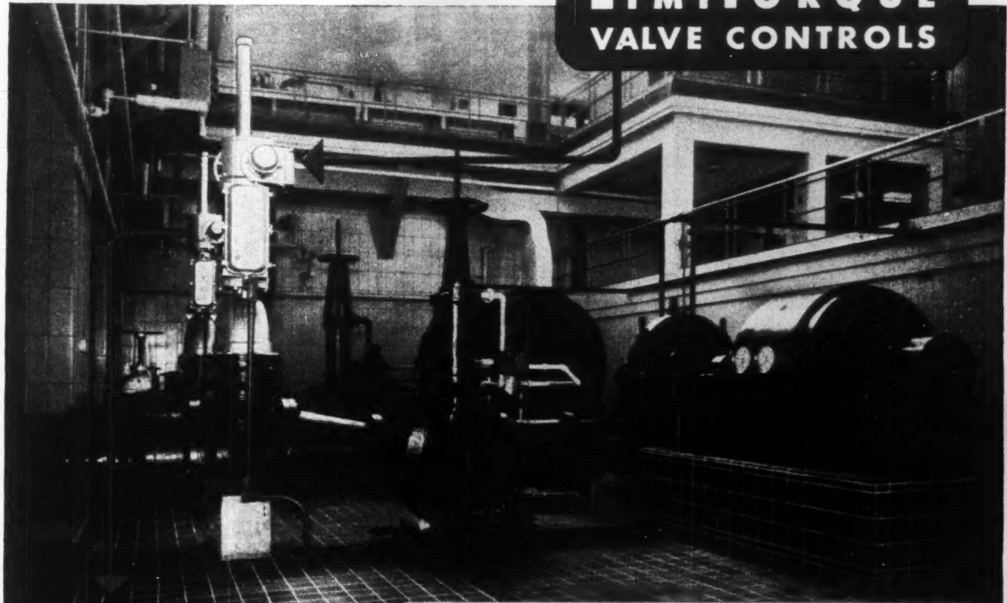
- **St. Anthony Falls**—Dredging of 280,000 cu yd of material in the lower pool was completed last year, and a $5,500,000 contract was awarded for the lower lock and dam. Two locks will lift boats and barges over St. Anthony Falls, while a dredged upper channel will lead to a new harbor to be built 4.6 mi. upstream. Total project cost is $20,500,000, with at least six more years required for completion. The new locks will be 56x 400 ft; the upper one providing a 49-ft lift, highest on the Mississippi. Other projects in the St. Paul District of the Corps of Engineers includes $20,300,000 of multipurpose reservoir construction and navigation improvement, of which $2,300,000 was completed last year; $3,200,000 worth of work will be awarded this year.

- **Mississippi River Valley**—Sixteen flood protection projects along the left bank of the Mississippi between Alton and Cairo, Ill., range from 19% to 98% completed, with an average completion of 54%. Total cost of the work, including raising, enlarging and extending existing levees, construction of new levees and closure structures, is $64,200,000. Last year, $5,500,000 worth of construction was placed under contract, with an additional $2,200,000 to be started this year.

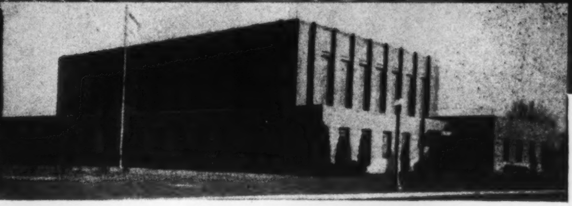
Navigation improvement on the **Middle Mississippi River** (between Cairo, Ill., and the mouth of the Missouri) estimated to cost $56,000,000, exclusive of the Chain of Rocks canal and locks, is 75% finished. From Cairo to St. Louis, the 191 mi of improved channel will be at least 9 ft deep and 300 ft wide. From St. Louis to the mouth of the Missouri, 4 mi upstream, the channel will be 9 ft deep and at least 200 ft wide. No additional work, however, is expected to be placed under contract on this project during 1951.

- **Chain of Rocks**—Construction of the dam and lock project to improve navigation on the Mississippi River by by-passing this treacherous reach, was

# PHILADELPHIA PICKS PHILADELPHIA LIMITORQUE VALVE CONTROLS



## . . . for the New TORRESDALE FILTERED WATER PUMPING STATION



Here, as at so many other modern water works stations throughout the country, LimiTorque Controls were selected for valve operation.

LimiTorque Remote Control permits one man to open and close large or inaccessible valves by merely pushing a button. All the while he can see the status of each valve on a panelboard. This saves considerable time and manpower and assures a better coordination of plant operation.

Damage to seats, stems, discs, etc., is prevented because LimiTorque shuts off the power if an obstruction occurs.

LimiTorque fits all types of valves and may be actuated by any available power source such as electricity, gas, water, air, steam, etc.

Your valve manufacturer can supply them.

*Valves shown with LimiTorque Controls were made by A. P. Smith Co.*

**Write for a copy of LimiTorque Catalog L-50 which gives full details of all types of LimiTorque Controls. Please write on your Business Letterhead.**

L IMITORQUE
CONTROL

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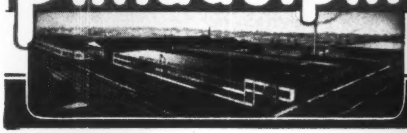

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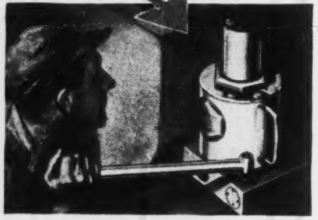
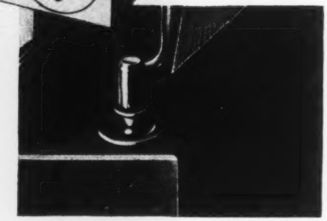
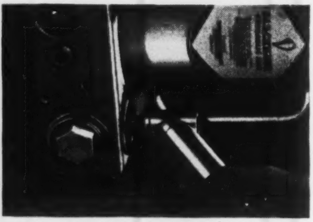


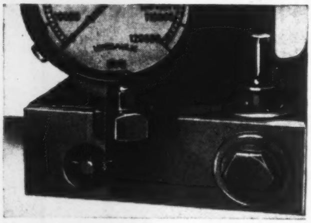
**PATENTED DOUBLE PUMP**—all in ONE unit! Speed pump provides fast load contact—power pump cuts in automatically! No shifting of handle, no double-yoke as with separate pumps.



**EXTRA SAFETY** — The pump beam is protected by the handle and base. The pump is protectively hidden in the super-strong base which is machined from a single piece of steel.



**ALL-DIRECTIONAL OPERATION** — Full power and travel at any angle, vertical to horizontal. The handle serves as a side-rest for horizontal use.



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**HALES BAR—TVA has torn out part of the dam to make room for more power at the Tennessee River plant.**

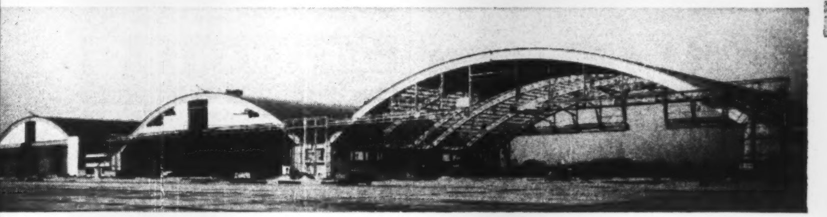
69% finished at the end of last year. The $40,000,000 project, to be completed by 1953, includes an 8-mi lateral canal, a 1,200x110 ft main lock, and a 600x110 ft auxiliary lock. Construction completed last year totaled $8,800,000, while this year's program calls for an additional $2,000,000 of work to be done. Additional improvements in the program will be done under the supervision of the Corps of Engineers at a cost of $17,500,000 to local interests.

• **Lower Mississippi River**—Flood control and river improvement projects completed last year by the Corps of Engineers in its Lower Mississippi River Division (below Cairo, Ill.) totaled $61,800,000. Contracts totaling $63,100,000 were awarded last year, while an estimated $59,300,000 will be awarded during 1951.

Construction of the $13,000,000 **Algiers Lock and Canal**—a navigation connection between the Gulf Intracostal Waterway and the Mississippi River, below New Orleans—was 25% finished at the end of last year. When completed next year, this 9-mi canal will relieve traffic congestion through the over-loaded Harvey Lock and keep east-west through traffic out of the most congested area of the Port of New Orleans. Contracts for $3,400,000 of additional work on this project will be awarded during the first half of this year.

Construction of the $33,000,000 single-purpose flood-control **Texarkana Reservoir** on the Sulphur River, a tributary of the Red River in northeast Texas, is 11% finished. Its 18,500-ft earth embankment will store 2,510,000 acre-ft of floodwater. Plans are to award an additional $11,500,-

# HUGE STEEL-ARCH HANGARS *go up fast!*



▲ Principal roof members are curved, riveted plate girders. Pinned at supports and crown, they have a constant depth, back to back of flange angles of 5 ft. 7 in. and rise 49 ft. 11 in. to provide a clear height at center of 75 ft.

◀ Interconnected by 2-story steel frame lean-tos ranging in width from 39 to 103 ft., the hangars form a building 1,148 ft. long and 219 ft. wide. Each hangar provides a 300 ft. clear floor space.

## *302′ Steel-Arch Spans* SIMPLIFY ERECTION . . .

## PROVE MOST ECONOMICAL TYPE OF CONSTRUCTION

**PROJECT:** Three hangars and interconnecting lean-tos at New York International Airport, Queens, New York City.

**DESIGNED BY:** Port of New York Authority, Roberts and Schaefer Company, Consulting Engineers. Lorimer and Rose, Associate Architects.

**GENERAL CONTRACTOR:** Stock Construction Corporation.

**STRUCTURAL STEEL:** 3,600 Tons. Fabricated and erected by American Bridge Company.

Erected in 13 months (complete with heating, fire-alarm and lighting systems) the three giant, 300′-wide, 219′-long hangars with interconnecting 2-story lean-tos have set a record for this type of construction—both as to length of spans and speed of construction.

Erected in four sections, the 302′-steel arches are pinned at the supports and crown to provide a clear height at the center of 75 ft. Each hangar is large enough to accommodate 6 Douglas DC-6 transports or four double-deck Boeing Stratocruisers. In addition, parking aprons on both sides of the building can take 15 aircraft of the type having a turning circle of 175 ft., or 19 of the smaller type having a turning circle of 150 ft.

The decision to use long panels between solid web steel arches for this important project was made after studied consideration of other types of construction materials. And again steel proved most economical by meeting all comers in competitive bids.

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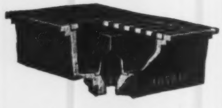

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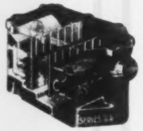

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000 of work by June 30 of this year, with completion scheduled for 1954.

Near St. Charles, La., **Calcasieu Lock**—to prevent salt water in the Gulf of Mexico from intruding into the Gulf Intracostal Waterway and overflowing adjacent agricultural lands—was near enough to completion last December to permit opening the lock to navigation. Project cost will be $1,970,000.

Another salt-water control structure in southern Louisiana,, **Catfish Point Control Structure,** will be completed early this year at a cost of $1,600,000.

• **Atchafalaya Basin**—Four major projects are under way to expedite operation of the Atchafalaya Basin Floodway System—designed to divert 1,500,000 cfs of floodwater from the Mississippi River to the Gulf of Mexico. The $21,000,000 **Morganza Floodway Control Structure** project is 12% finished. Completion is scheduled for 1954, with emergency operation possibly early in 1953. Contracts totaling $8,600,000 were awarded last year, and $1,600,000 of work will be awarded by July 1 of this year. **East and West Calumet Floodgates,** located in the guide levees of the Wax Lake outlet (one of two outlets of the Atchafalaya Basin floodway) were completed last September at a cost of $1,250,000. The $1,700,000 **Berwick Lock** project located below the Berwick-Morgan City outlet (the other outlet of the floodway) was far enough advanced last November to open the lock to navigation. **Bayou Sorrel Lock**—to insure uninterrupted passage of Gulf Intracostal Waterway traffic on the alternate Morgan City-Plaquemine, La., route when the floodway is in operation—was 93% finished at the end of last year. Project cost is $4,600,000.

• **Texas Rivers**—Four wild and unruly Texas watersheds—the Neches, Trinity, Brazos and Colorado—are being tamed by the construction of eight Corps of Engineer reservoir projects at a total cost of $145.6 million. Largest of the projects is the $42,000,000 **Whitney Dam** on the Brazos River. Its 16,000-ft long, 167-ft high, rolled-fill embankment and 824-ft concrete spillway are finished. Contracts totaling $14,700,000 will be awarded this year, including one for a 30,000-kw power plant. Now 70% finished, Whitney's completion is scheduled for 1953. The $7,300,000 flood-control and regulating **Dam "B"** on the Neches River will be finished this year.

Four reservoir projects now under way will control the upper Trinity River watershed. They are: 9,200-ft

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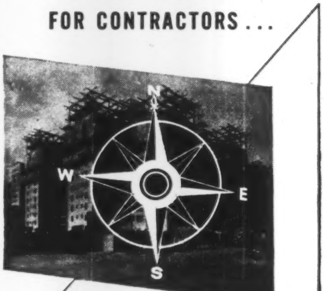

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long Benbrook Dam, over two-thirds completed and in partial operation; 12,850-ft long **Grapevine Dam**, which also will furnish additional water supply for Dallas, 50% completed; and 9,540-ft long **Lavon Dam**, over 50% finished. Each of these three rolled-fill dams will cost $12,000,000, and all will be finished next year. The fourth project, **Garza-Little Elm Dam**, also will furnish water for Dallas. It will contain a 33,000-ft long by 125-ft high rolled-fill embankment. Now 15% finished, this $26,600,000 project is scheduled for completion in 1954.

Newest project in the eight-dam program is the $17,800,000 **Belton Dam** on the Leon River, a tributary of the Brazos. It will contain a 3,800x 191-ft rolled fill embankment. Only 10% finished, the project is scheduled for completion in 1955. The 7-mile long, 128-ft high, rolled-fill **San Angelo Dam** on the North Concho—a tributary of the Colorado River—is finished except for the closure section. Diversion through the completed concrete outlet works was commenced late last year, and the entire $16,200,000 project will be completed next year.

- **Rio Grande** — Contracts totaling $20,680,000 were awarded last year for initial construction and materials on Falcon Dam—first international multipurpose reservoir project on the Rio Grande. Mexico awarded a $7,920,000 contract for construction in that country, while the United States awarded a $7,800,000 construction contract, and material contracts—including six 14,000-hp hydraulic turbines and six 10,500-kw generators—totaling $4,960,000. Construction of this flood control, irrigation and power project located 75 miles below Laredo, Texas, was started last December by the International Boundary and Water Commission. It will contain a 26,290-ft long, 150-ft high rolled fill earth embankment with a 456,000-cfs concrete spillway; also two power stations each having 31,500-kw capacity. One will be in this country and one in Mexico. This year's program calls for awarding $4,600,000 of contracts for gates, valves and other operating equipment.

- **Oklahoma Rivers**—One large reservoir project—**Heyburn Dam** on Polecat Creek was virtually completed last year, while three others are under construction. All four are located in Oklahoma, on tributaries of the Arkansas River. Scheduled next for completion (this spring) is the flood control **Hulah Dam** on the **Caney River** near Bartlesville. It will contain a 470-ft long gravity-type concrete

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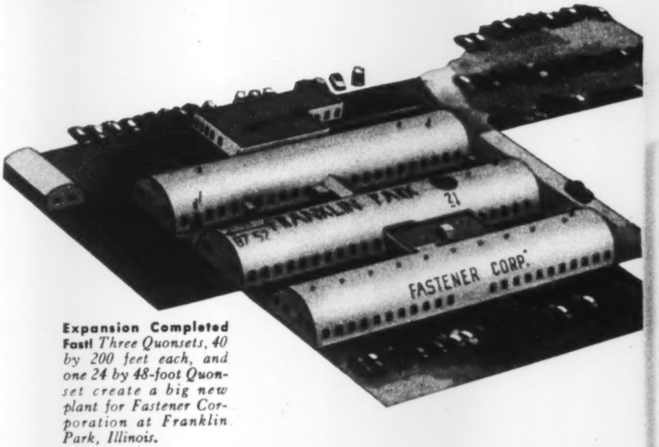

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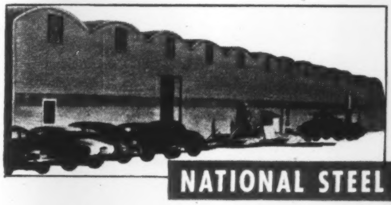

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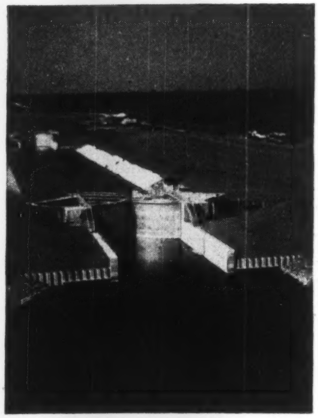

**BAYOU SORREL LOCK–A** navigation aid on the Intracoastal Waterway in the Atchafalaya Basin, La.

spillway, and 4,730 ft of 60-ft high, earth embankment. The concrete spillway and 2,850 ft long, 110 ft high, concrete gravity section and rolled-filled earth embankment of **Fort Gibson** dam on the Grand River were finished last year. This flood control and hydropower project is 64% finished, with the delivery of initial power scheduled for early summer of 1953.

The spillway and outlet works of **Tenkiller Ferry Dam** on the Illinois River (in Oklahoma) were completed last year. First-phase embankment work is done, and the second phase started.

• **Arkansas Rivers**–Good construction progress at **Bull Shoals Dam** on the White River, resulted in $19,000,000 worth of work being completed last year. The 2,100,000-cu yd concrete dam will be completed this spring. Work on the powerhouse began last fall and initial power generation of 168,400 kw is scheduled for the summer of 1952.

All tunnel and spillway structure work at the $32,700,000 **Blakely Mountain Dam** and power plant on the Ouachita River near Hot Springs has been completed. Construction of the 205-ft high by 1,100-ft long, rolled-fill embankment and intake structure is 35% finished. A $1,000,000 contract has been awarded for delivery of two 52,000-hp turbines in 1953, and contracts for two 37,500-kw generators will be awarded this spring. Contracts also will be awarded this year for clearing the reservoir area, expected to cost $3,000,000; and $650,000 for relocating state and county roads. Completion

(Continued on p. 211)

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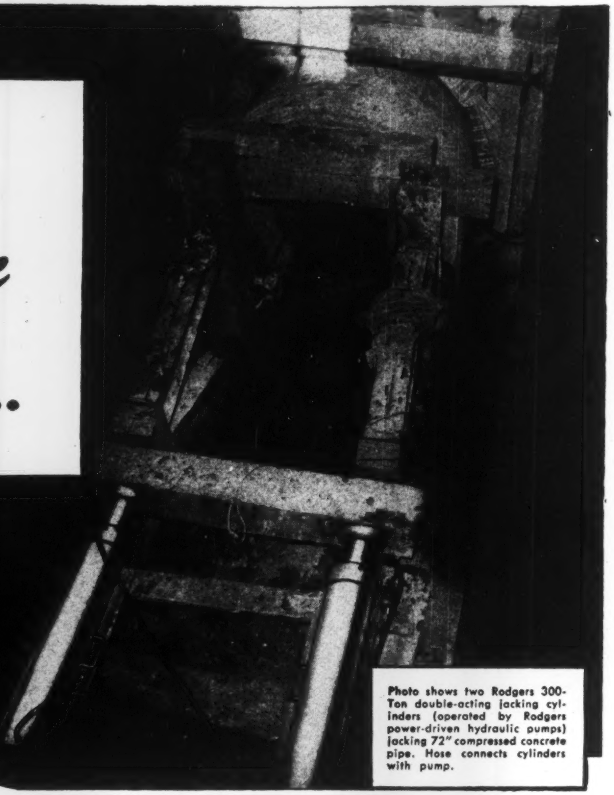

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HYDRAULIC POWER EQUIPMENT

date is scheduled to be in 1954.

Construction at **Narrows Dam** and power plant—a $13,500,000 flood-control and hydropower project on the Little Missouri River near Murfreesboro—was virtually completed last year. Generation of power from its 17,000-kw power plant was begun last summer.

• **Missouri River Basin**—Last year was a record year for construction by the Bureau of Reclamation in its Region VI (the Dakotas and parts of Montana and Wyoming). Construction and supply contracts awarded during the year totaled $21,250,000—an increase of $3,250,000 over 1949.

At the close of 1950, seven major dams in the region were either under construction or had been completed. Ultimately, they will produce 420 million kwhr of electric power annually and store water for irrigating 700,000 acres of land. **Dickinson Dam** on the Heart River in North Dakota and **Shadehill Dam** on the Grand River in South Dakota were completed last year. **Heart Butte Dam** on the Heart River in North Dakota—completed just a few days before the beginning of 1950—attracted national attention last year by saving Mandan, N. D., from a record flood.

Also completed is **Angostura Dam** on the Cheyenne River in South Dakota; its 1,200-kw power plant will start operating this July. **Boysen Dam** project on the Bighorn River in Wyoming is 85% finished. The dam will be completed this November, and the 15,000-kw power station will start operating next spring. Water stored by this dam will irrigate 120,000 acres.

Progress was made on **Canyon Ferry Dam** on the Missouri River—first major unit of the Missouri River Basin program to be started in Montana. It will store irrigation water for 310,000 acres of new land and provide a stable supply for an additionl 196,300 acres now inadequately served. Both the 212-ft high, 1,000-ft long concrete dam and its 50,000-kw power plant will be completed in 1953.

The diversion tunnel for **Keyhole Dam** on the Belle Fourche River in Wyoming is completed, and excavation has been carried to bedrock along the entire length of the 3,420-ft long, 164-ft high, earth-fill dam. The dam will be completed this year.

Region VI also has several hundred miles of power transmission lines under contract and expects to accelerate this program during 1950. One such project will be a 520-mi transmission line loop in South Dakota.

Bureau of Reclamation's Region

(*Continued on p. 214*)

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New York 17, New York • San Francisco 5, Calif.

# ANNOUNCING...

# The NEW SHELL ROTELLA OIL

## (Extra Heavy Duty Type)

*"... exceeds every accepted performance standard for oils in its class"*

### OUTSTANDING PISTON CLEANLINESS

The new Shell Rotella Oil stands out in the very top bracket with respect to Piston Cleanliness, providing convincing proof of its ability to keep contaminants out of the critical zone in which wear is concentrated.

### MUCH LOWER RING DEPOSITS

Ring-plugging tests are really tough, yet new Shell Rotella Oil came through stiff competition with a remarkably low ring deposit rating . . . far below the established passing mark!

### GREATER ENGINE LIFE

Recognized laboratory engine tests are important in establishing qualifications of lubricants to meet strict requirements. More important to operators, however, is the *tremendous increase in engine life* and the consequent reduction in maintenance expense and time out-of-service that the new Shell Rotella Oil is contributing to fleet operation under today's conditions.

**NEW SHELL ROTELLA OIL . . .**

# Stepped up cleaning action...

# Even greater anti-wear protection

**. . . anticipating the needs of today's high performance fleet engines**

Today's hauling conditions are imposing greatly increased demands upon fleet engines . . . and the lubricants selected to keep them running. At the same time these high-performance engines are expected to turn in ever-increasing mileage records between overhauls.

For these reasons, and because even greater performance will probably be expected as time goes on, the detergent-dispersant and anti-wear qualities of Shell Rotella Oil have been markedly increased.

Operators using Shell Rotella Oil in the past will find an even greater latitude in maintenance procedures.

## 4-WAY LIFE EXTENSION FOR BUSY ENGINES

**1. Remarkable detergent-dispersant action**

The ability to suspend contaminants has been deliberately stepped up in the new oil. Field tests on vehicles, in widely varying kinds of service, prove conclusively that this greater detergent-dispersant action extends mileage between overhauls.

**2. Drastic sludge reduction**

Operators who have been having sludge troubles . . . with clogged pump screens, burned out bearings, or clogged oil ways . . . are urged to find out for themselves how remarkably clean those engines will remain while using this new anti-sludge Shell Rotella Oil.

**3. Positive Anti-acid action**

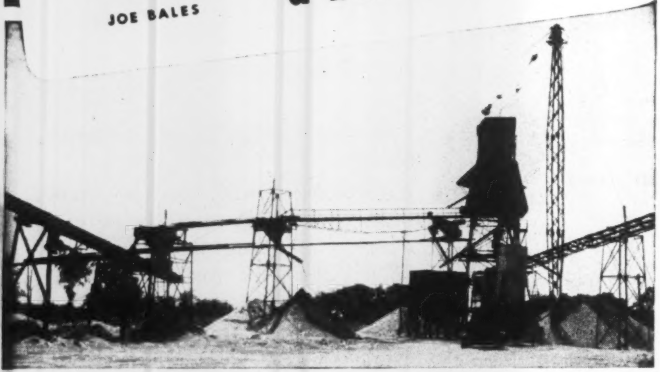
New Shell Rotella Oil directly counteracts the acid action of fuel combustion products in the vital top-cylinder zone . . . with correspondingly great reduction in wear. This protection is extremely important in the operation of intermittently loaded engines.

**4. Extends time between engine overhauls**

New or reconditioned engines . . . operating on fuels of widely-varying quality . . . in all kinds of fleet service . . . have demonstrated an important extension of in-service time. *This gain results from improvement in several basic respects: freedom from sludge and ring-clogging, increased valve life and greatly reduced wear.*

SHELL

**for all heavy duty fleet engines**



300 Yards a Day for 4½ Years... "I couldn't want a better screen."

JOE BALES

LIKE many widely experienced men in the aggregates business, Joe Bales has used a number of different screens, but the one he is using *now* at the Bluff Road Sand and Gravel Company, Indianapolis, Indiana, is a Deister Vibrating Screen.

"In 4½ years of operation, we've never had any trouble with this Deister Screen," says Mr. Bales.

"And the screen sure handles the load. To produce 300 yards a day, we often must get 1 yard a minute from this screen. I can say that it is really built . . . and really good. In fact, I couldn't want a better screen."

The Deister employed at Bluff Road is a triple-deck 3′x8′ unit, sizing 1½″ L gravel, ¾″ gravel, and ¼″ concrete sand. This unit, like all Deister Vibrating Screens, has an exclusive, elliptical throw with vigorous, positive action for fast accurate sizing. It is ruggedly built, with simple, oil bath lubricated two-bearing construction for long, trouble-free service.

It is the kind of screen that operators like Joe Bales say will "put more profit in your business." Why not get all the facts on Deister Vibrating Screens for your operation? Just ask for a copy of Bulletin No. 50 which shows you how to specify the proper vibrating screen for your requirements.

DEISTER SCREENS

DEISTER MACHINE CO.
FORT WAYNE 4, INDIANA

VII (Nebraska and parts of Wyoming and Colorado) has four Missouri River Basin dams under construction, four in preconstruction stages, and 41 various stages in planning.

Completed last year, **Kortes Dam** on the North Platte River in Wyoming—the first project to be started under the Pick-Sloan Plan—cost $13,800,000. Three 12,000-kw hydroelectric power units were placed in service.

Also finished last year were **Enders** and **Medicine Creek Reservoirs,** part of the $62,000,000 **Frenchman-Cambridge** irrigation projeect in the Republican River valley in southwestern Nebraska. **Trenton Dam** was started and advanced to 20% completion by year's end.

Now 73% finished, **Cedar Bluff Dam** on the Smoky Hill River in Kansas will be completed this year. Water is being impounded for the irrigation of 11,500 acres by 1956. **Bonny Dam** on the South Fork of the Republican River in Colorado is virtually finished and will be completed this year. It will irrigate 6,500 acres by 1956.

Last year, Region VII awarded contracts for $58,100,000 worth of construction in the Missouri River Basin, with an additional $8,800,000 to be started this year. It's $47,700,000 power transmission program is 15% finished, with 400 mi of lines now in service.

The Corps of Engineers advanced its authorized flood-control and river-development program in the Missouri River Basin to 37% completion at the close of 1950. A total of $37,000,000 of major construction contracts were awarded last year, and $95,000,000 of work was completed. Additional contracts totaling $170 million will be awarded this year on current projects.

Initial construction contracts of $1,500,000 were completed last year at **Oahe Dam** on the Missouri near Pierre, S. D. Power from this $245 million project, containing a 78,000,000-cu yd rolled fill embankment, is scheduled for 1959.

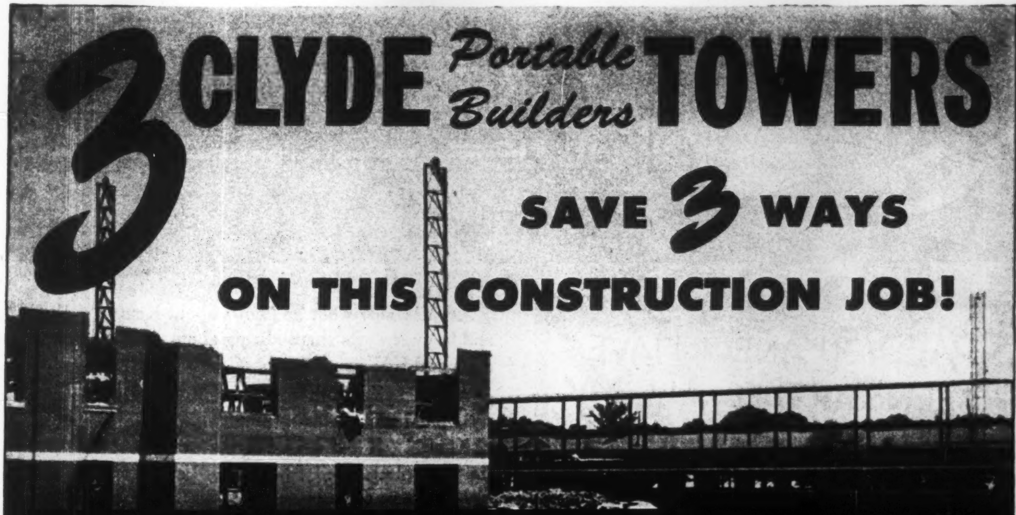
In South Dakota, **Fort Randall Dam** project is 38% finished; $25,000,000 of construction was completed last year; and an additional $45,000,000 will be awarded this year. Initial power from this $170 million project is planned for 1954.

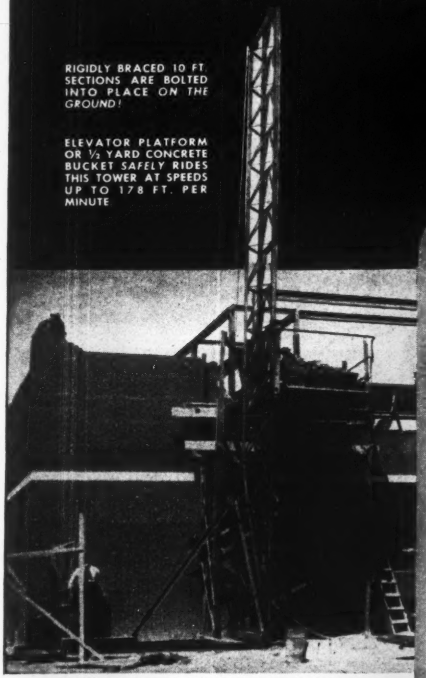
In North Dakota, **Garrison Dam** was 34% completed at the end of last year. The 70,000,000-cu yd rolled-fill embankment was 42% finished, while the outlet works, including 8 large tunnels, were 39% finished. Last year $15,000,000 worth of contracts were awarded and $34,500,000

(*Continued on page 218*)

# 3 CLYDE *Portable Builders* TOWERS

## SAVE 3 WAYS ON THIS CONSTRUCTION JOB!





RIGIDLY BRACED 10 FT. SECTIONS ARE BOLTED INTO PLACE *ON THE GROUND!*

ELEVATOR PLATFORM OR ½ YARD CONCRETE BUCKET *SAFELY* RIDES THIS TOWER AT SPEEDS UP TO 178 FT. PER MINUTE

1. **SAVE TIME**—Clyde Towers are easily assembled on the ground, cable reeved and tower erected by its own hoist. *Clyde towers 100 feet high are self-raising.*
2. **SAVE LABOR**—Truck it to the site in the morning! Have it in operation before noon! Hoist loads up to 2500 lbs. at speeds up to 178 f.p.m. with elevator platform or concrete hopper bucket.
3. **SAVE MONEY**—Clyde Towers eliminate the replacement cost of tower timbers and may be transported to a new site and erected at a fraction of timber tower costs.

### PUT UP A CLYDE TO LOWER YOUR COSTS!

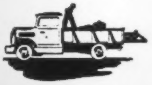
Clyde Portable Builders Towers are up and in operation with but a few man hours of time! And once the Clyde is on the job, it's like having an additional crew at work.

Elevator platform carries two concrete buggies or two wheelbarrows. Safety brake is available to hold load in case of cable failure. If you are pouring concrete, the half yard hopper bucket rides the tower smoothly, swiftly, *safely!* A one ton capacity tower derrick can save you additional time and money by hoisting timbers, structural steel, etc.

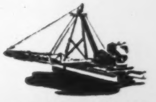
When you investigate the many money saving, *profit making* features of Clyde Portable Builders Towers you will know that material handling costs come down and profits rise just as soon as a Clyde is put in operation on your construction work.

### SIMPLE, EASY TO ERECT OR DISMANTLE

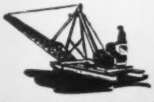
Tower is transported by truck or towed on trailer wheels which attach to tower base.



Assemble tower *on the ground,* thus eliminating accident hazards.



Tower is raised with its own hoist. No cranes or gin poles are needed.



**WRITE TODAY FOR COMPLETE INFORMATION**

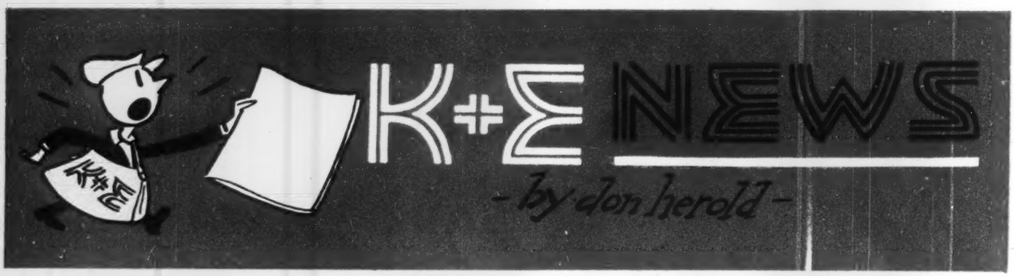
CLYDE

HOISTS • DERRICKS • WHIRLEYS • BUILDERS TOWERS • CAR PULLERS • HANDI-CRANES • ROLLERS

## CLYDE IRON WORKS, Inc.

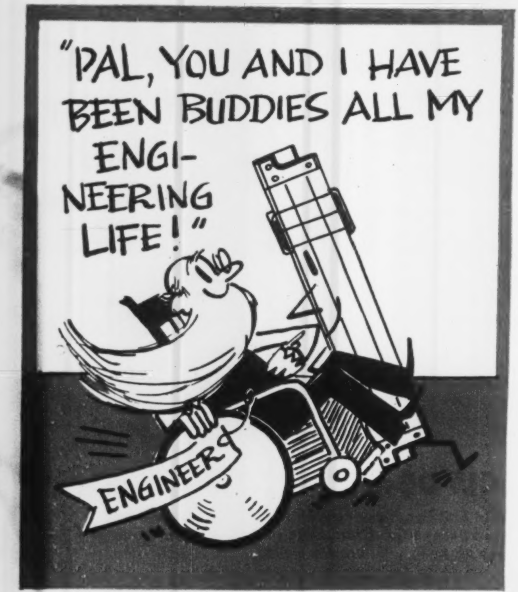
DULUTH 1, MINNESOTA

SUBSIDIARY OF BARIUM STEEL CORPORATION



# K+E NEWS

-by don herold-


"PAL, YOU AND I HAVE BEEN BUDDIES ALL MY ENGI-NEERING LIFE!"
ENGINEERS

Ask anybody what he knows about Keuffel & Esser, and he first starts rhapsodizing about slide rules. Slide rules and K&E are synonymous.

And they're both almost as long lasting as the pyramids!

Keuffel & Esser have been around since 1867 and they completed their first batch of slide rules in 1891.

It is not uncommon to hear of a K&E rule which has been in service for over 50 years.

I used to think a slide rule was a slide rule—just as a yard stick is a yard stick—but there is a sensational variety of 'em in the K&E line—from the simple Mannheim to the more complicated brethren, such as the Log Log Duplex Trig and Decitrig and the Log Log Duplex Vector*.

Also, there are several sizes from the handy pocket rules, to the more common 10-inch, up to the 20-inch longfellows.

There's no point to hitching up for life with a "second best" slide rule when you can play a Keuffel & Esser.

*Trade Marks ®

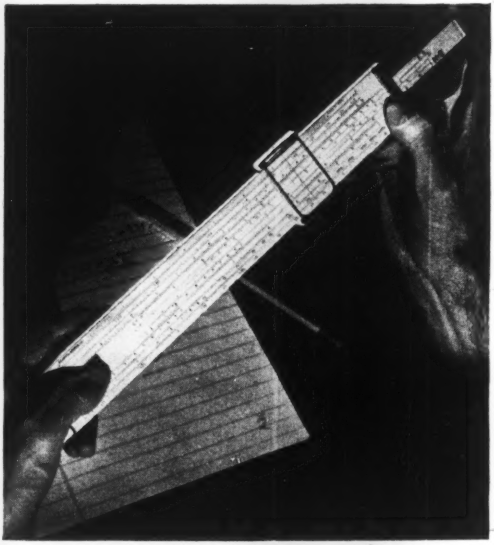
## Down through the years with a K&E Slide Rule

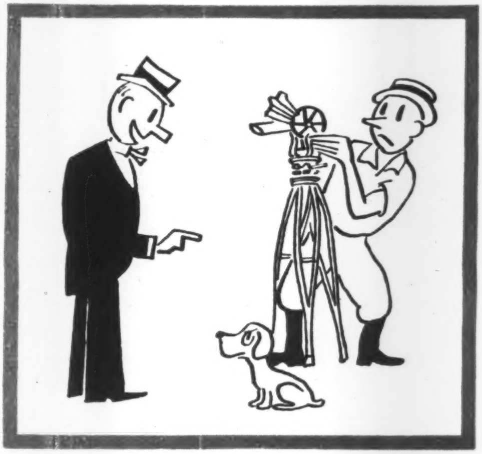
Although K&E Slide Rules are the oldest slide rules made in America, there are no whiskers on 'em—except cat's whiskers (I mean, symbolizing precision).

If you are an old engineer, you probably regard your K&E Slide Rule as a priceless Stradivarius. You are probably figuring on passing it down to your grandchildren.

If you are a beginner, the sooner you attach yourself to an immortal K&E rule, the better.

K&E Slide Rules have become accepted symbols of the engineering profession. If a photographer, illustrator or cartoonist wants to indicate that his hero is a top-flight engineer, he puts a K&E Slide Rule in his hand or in the immediate environment.





## "PARAGON, eh.....
## has it a pedigree?"

Yes, sir, there's a long pedigree to every K&E PARAGON* Surveying Instrument.

When you buy surveying instruments, you're not buying toothpicks or neckties. You're buying accuracy and endurance for a lifetime. And you're spending real money.

You want to know about the optics, the accuracy, the metals used, the wear on moving parts, the permanency of adjustment, the resistance to dust and moisture, the workmanship—and many other things.

These questions are all pretty well answered in Keuffel & Esser's 83-year-old reputation for making mighty good things for engineers and draftsmen. For 83 years, K&E equipment and materials have been partners in nearly every engineering project of any size anywhere. So, that's why I say: buy K&E PARAGON Surveying Instruments.

## K&E make 300 different kinds of *Graph Sheets*

HOW MUCH DO YOU LOVE ME TONIGHT?
OH, JOHN!

What do you want to graph—Grandma's health or variations in the price of spinach—polar coordinates or the surface tension of prunes?

Send for
this
free
book

K&E have a graph form for almost anything. Ask your K&E distributor or the factory for a catalog of their 300 forms, or if you need one they don't have, maybe they'll make up one for you, tailor-made.

They have graph sheets for plotting scientific data—square or rectangular section, logarithmic, reciprocal, electrical, and such. And forms for sketching and drawing, whether mechanical and architectural or for surveying and mapping. Also, business and financial graph forms—time series, data sheets and percentage. Their forms are on high quality tough drawing paper and on top quality tracing papers (including the famous ALBANENE*). Don't grope—graph ... on a K&E form.

*Trade Mark®

K+E
**partners in creating**
For 83 years K&E equipment and materials have been partners of the draftsman, engineer and scientist in shaping the modern world.

**KEUFFEL & ESSER CO.**
EST. 1867
*Drafting, Reproduction, Surveying Equipment and Materials, Slide Rules, Measuring Tapes*
NEW YORK • HOBOKEN, N. J.
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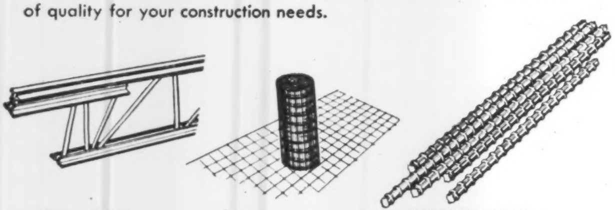
LACLEDE
CONSTRUCTION STEEL

*Jaccards Building, Clayton, Mo.*
*Architect: D. F. Rixman*
*Builder & Owner: S. M. Studt*

THE SIGN OF QUALITY CONSTRUCTION

Carefully controlled from open hearth to finished product in the modern Laclede mills, these construction steels offer dependability of quality for your construction needs.



**STEEL JOISTS**
For strong . . . lightweight . . . economical construction. Spans to 40 feet.

**WELDED WIRE FABRIC**
Cold drawn, welded automatically . . . in rolls or sheets.

**MULTI-RIB ROUND REINFORCING BARS**
With Laclede improved design for maximum anchorage . . . and numbered to meet latest ASTM A305 Specifications.

Other Laclede quality construction steels: corrugated centering accessories • spirals • pipe and conduit.

® LACLEDE
Producers of Construction Steel

**LACLEDE STEEL COMPANY**
St. Louis, Mo

**Diamond Core Drilling**

CORE BORINGS
for Foundations, Dams, Bridges and all Heavy Structures
GROUT HOLES

**Tinney Drilling Co.**
Grafton, W. Va.

**OHIO**
LOCOMOTIVE CRANES
GASOLINE • DIESEL
ELECTRIC • STEAM

25 TO 40 TON CAPACITY

THE OHIO LOCOMOTIVE CRANE CO
BUCYRUS, OHIO

completed at Garrison. About $78,000,000 of work will be awarded this year, including a contract to be awarded late this fall for the remaining earthwork, closure of the embankment and diversion of the river.

In Kansas, **Kanopolis Reservoir** on the smoky Hill River was completed last year at a cost of $12,000,000. It has already prevented flood damages of $2,250,000. Also, the **Cherry Creek** flood control dam near Denver was essentially completed last year.

Closure of **Harlan County Dam** on the Republican River in southern Nebraska will be made this year. Now 78% finished, this $50,000,000 project will be completed in 1952.

Both the **Omaha** and the **Council Bluffs** levee systems, totaling $9,000,000, were substantially completed last year. The river stabilization and 9-ft channel navigation project between Sioux City and the mouth of the Missouri is 70% finished, with 200 mi of agricultural levees completed to date. The 41,000,000 **Kansas City** flood protection—to protect one billion dollars worth of industry in a 26-sq mi area—is 57% finished, with $10,000,000 of new contracts to be let this year.

A third power unit under construction at **Fort Peck Dam** in Montana will be finished this year. Initial Construction may start this year on **Gavins Point Dam** on the Missouri near Yanktown, S. D. A $42,300,000 flood control project, it is being built to regulate fluctuating discharges from Fort Randall, located upstream.

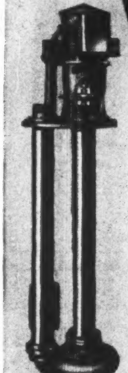
• **Lower Colorado River Basin**—At **Hoover Dam**, installation of three new generators in the Arizona wing of the power plant got under way in 1950. These units will go into commercial production during the first half of 1952.

Near completion are **Davis Dam** and power plant and some 1,500 miles of new transmission lines (connecting **Hoover, Davis** and **Parker Dam** power plants with markets in southern California, southern Nevada, and Arizona). The first **Davis Dam** generating unit was installed and placed on the line in January. The other four units, giving the plant an installed capacity of 225,000 kw will be in operation by the summer of 1951.

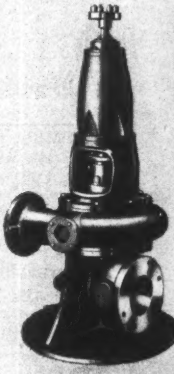
The 18½-mi **Welton-Mohawk Canal** was 80% completed and work on the three pumping plants and the 43-mi Mohawk branch canal was started. The canal system will deliver its first water from the Colorado River above **Imperial Dam** to the Welton-Mohawk division of the **Gila Project** in southwestern Arizona early in 1952.

Last year, **Morelos Dam** was completed. This project built by the pumping sewage?....

# LOOK TO ECONOMY!



**Sump Pumps**
**Capacities to 5,000 G.P.M.**
**Heads to 120 ft.**



**Vertical**
**Non-Clog Pumps**
**Capacities to 20,000 G.P.M.**
**Heads to 125 ft.**

In severe service, Economy non-clogging pumps installed as long ago as 1911 are still on the job, still giving satisfactory service.

They're built for long life! Construction is heavy and substantial. Rotating parts are rigidly supported to withstand vibration due to the unbalancing of the impeller while passing solids. Impellers, volutes and waterways are of highly developed design, based on long experience in pumping sewage. As a result these Economy pumps represent the ultimate in ability to pass solids, and are highly efficient. Careful inspection and a complete factory running test assure the hydraulic and mechanical efficiency of every unit.

**When it's pumps, think of Economy**

**Mixed-Flow**
**Volute Pumps**
**Capacities to 50,000 G.P.M.**
**Heads to 115 ft.**

Catalog No. F249 gives full details on vertical non-clogging pumps; Catalog No. E-345 on sump pumps; Catalog No. F-1049 on mixed-flow volute pumps. For your copies, write Dept. CB-3.

**Centrifugal, axial and mixed-flow pumps for all applications**

## Economy Pumps, Inc.

**DIVISION OF HAMILTON-THOMAS CORP., HAMILTON, OHIO**

TAC does what no other tool can do!

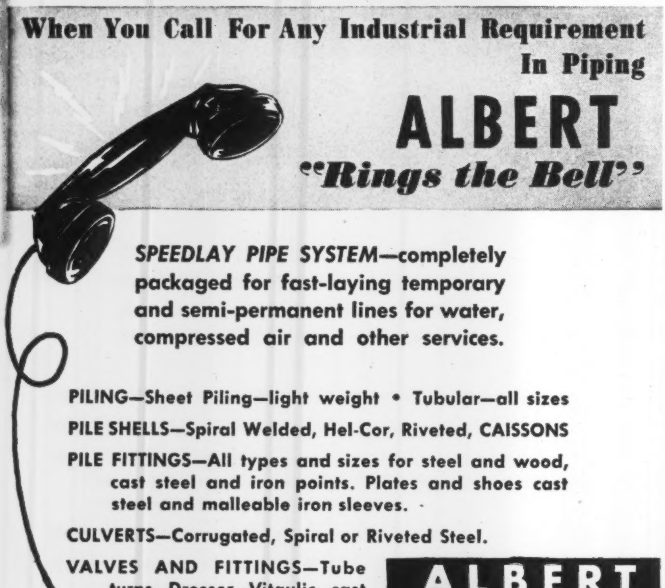
AT LAST! AN OPEN-END RATCHET WRENCH — the world's first true *universal* wrench. A patented design for connections on tubing, rods, piping, conduit, studs, etc. Sixty-four socket sizes from ⅜" to 4". Smallest effective ratcheting arc yet — 5° to 7½°. TAC will also do every job any ordinary ratchet wrench will do: one TAC set replaces literally dozens of single-purpose hand tools.

makers of advanced tools for industry

TAC

TAC is the registered trademark of

TUBING APPLIANCE CO.
7112 South Victoria • 10321 Anza Ave. • Los Angeles, Calif.


When You Call For Any Industrial Requirement In Piping

ALBERT "Rings the Bell"

*SPEEDLAY PIPE SYSTEM*—completely packaged for fast-laying temporary and semi-permanent lines for water, compressed air and other services.

PILING—Sheet Piling—light weight • Tubular—all sizes

PILE SHELLS—Spiral Welded, Hel-Cor, Riveted, CAISSONS

PILE FITTINGS—All types and sizes for steel and wood, cast steel and iron points. Plates and shoes cast steel and malleable iron sleeves.

CULVERTS—Corrugated, Spiral or Riveted Steel.

VALVES AND FITTINGS—Tube turns, Dresser, Vitaulic, cast iron or steel, forged steel, special alloys, water main.

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PIPE SUPPLY CO., INC.
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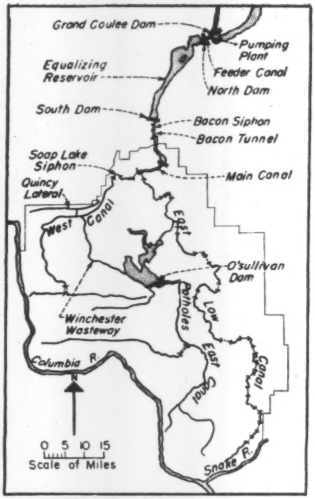
*SPECIALISTS IN PRE-FABRICATED PIPING*



**COLUMBIA BASIN** power and irrigation works will furnish 2,000,000 kw, irrigate 1,000,000 acres when completed.

Mexican government diverts Colorado River water to irrigate Mexican lands.

• **Colorado-Big Thompson** – Progress on this largest of all trans-mountain diversions was good in 1950. Now 67% complete, the job is expected to be finished in 1954, diverting water from the Colorado River Basin to the eastern slope of the Rocky Mountains. The major western slope structures have been completed, including the 13.1-mi **Alva B. Adams** tunnnel. Work is in progress on the power system and regulating reservoirs on the eastern slope, many parts of which have been completed. Now operating is 75,000 kw of the 171,000-kw installed capacity expected to be available in 1954. Temporary diversion since 1947 has given a supplemental water supply to some 24,000 acres of the 615,000 acres expected to be supplied ultimately. About $47,000,000 of contract work was started in calendar year 1950 with $23,000,000 expected to be started in 1951. **Granby Dam**, one of the major units, was finished in 1950, and Granby pumping plant was virtually completed.

• **Central Valley**–The first full and integrated operation of the project's initial features is scheduled for July, 1951, although several units have been in service for some time.

As of this January, 131 mi of **Friant-Kern Canal** were completed, except for construction of a small regulating reservoir. The remaining 22 mi are under construction, and final placement of concrete lining

# HYSTER...One of the Oldest Names in Tractor Equipment

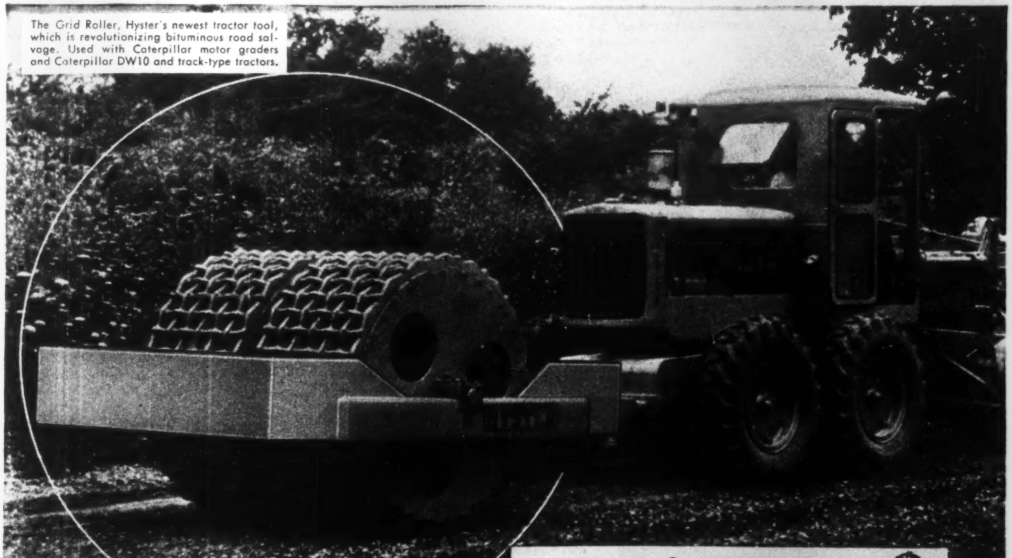
## *29 Hyster Tractor Tools*

. . . include a complete line of winches, yarders, donkeys, cranes, logging arches and sulkies; Grid Roller for bituminous road salvage; and Hystaway, the 5 in 1 tool that includes dragline, clamshell, crane, shovel and backhoe.

Hyster Tractor Tools make money for their owners in construction, logging, oil fields, road work, and in many branches of general industry.

**For 22 years** Hyster has made tractor tools for use with Caterpillar track-type tractors. Mounted on the big yellow machines, dependable Hyster tractor tools are at work on the roughest, toughest jobs all over the world.

Hyster tractor tools are sold and serviced by more than 400 Caterpillar-Hyster dealers around the globe.



The Grid Roller, Hyster's newest tractor tool, which is revolutionizing bituminous road salvage. Used with Caterpillar motor graders and Caterpillar DW10 and track-type tractors.

**HYSTER® COMPANY**

2953 N. E. CLACKAMAS ST., PORTLAND 8, OREGON
1853 NORTH ADAMS STREET, PEORIA 1, ILLINOIS

# LESS 'SHUT-DOWN TIME' DUE TO ADVERSE WEATHER WITH THE SEAMAN MIXER

When a sudden rain sends your road crew to shelter — you can start up your mixing operations again hours sooner if you have a SEAMAN.

Why? Because the SEAMAN'S aerating action quickly removes excess moisture by accelerating evaporation. Wet aggregates are readily dehydrated and a mix affected by adverse weather can be easily re-processed.

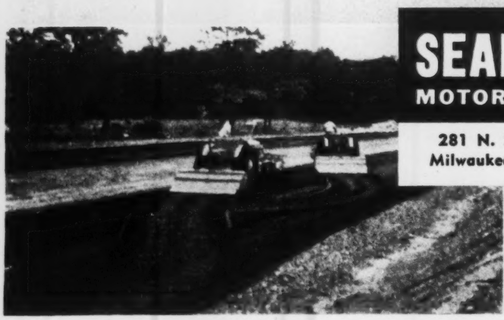
Mixing can be continued through colder weather, too, for even though the binder is sluggish in flow, a few additional low cost passes with the SEAMAN will bring the mix to the required standard. And, even in normal processing the SEAMAN is invaluable for reduction of solvents in a bituminous mix.

Those are just some of the advantages of a multiple pass machine. You *can* operate — you *can* complete the job even when conditions are unfavorable. That means a lot in terms of profit and the avoidance of costly shut-downs.

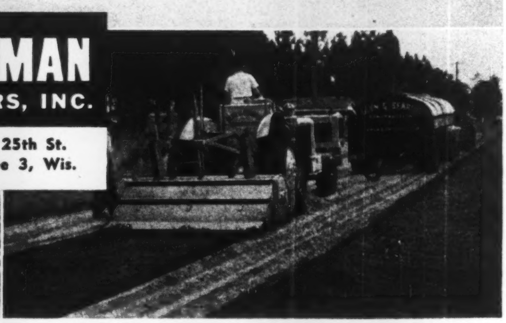
Spring and autumn months are notorious for bad weather. Protect yourself — with a SEAMAN.

The 1951 edition of "Soil Stabilization Methods"— completely revised. Up-to-the-minute information for the road-builder. Send for it now. Ask for Bulletin 25.

**The SEAMAN multiple pass method protects against processing failure when, due to bad weather or soils which resist pulverization, additional trips are needed. Further, multiple passes permit cross-mixing to blend out "lean" and "fat" spots.**



**The SEAMAN TRAV-L-PLANT is a complete processing unit for bituminous construction, soil-cement or any stabilization where water is employed. In addition to spray bar, pump, pump tachometer, fifth wheel and intake hose, all standard equipment—the SEAMAN TRAV-L-PLANT can be equipped with a meter to record total gallonage used.**



**SEAMAN**
**MOTORS, INC.**

281 N. 25th St.
Milwaukee 3, Wis.

took place Jan. 19. Other work includes some bridges, turnout structures and gates.

With 54 mi finished, **Delta-Mendota Canal** is virtually complete, the remaining 63 mi being 80% completed. The **Delta Cross Channel**—through which Sacramento River water flows through a mile-long cut and then into natural channels of the Delta to Tracy Pumping Plant—is due for completion in July. **Tracy Pumping Plant,** which will lift 4,600 cfs 200 ft into Delta-Mendota Canal, is 75% complete. The Tracy switchyard, terminus of the 230-kv lines from **Shasta** and **Keswick** dams, is 60% complete. Work is continuing on the transmission lines, with the east side line to be completed before July.

Already completed and in service are **Shasta** and **Keswick** dams and power plants, the **Contra Costa Canal, Madera Canal,** and **Friant Dam.**

Corps of Engineers work in the Central Valley area includes **Pine Flat, Folsom** and **Isabella** dams. A $24,000,000 contract for part of the Pine Flat construction was 17% completed in 1950, with completion set for 1954.

Five contracts for early-stage work at **Folsom Dam,** aggregating $750,000, were in various stages of completion at the end of 1950. In 1951, bids are to be opened on additional abutment excavation and other work; **Mormon Island Auxiliary** dam; main dam outlet gates; and a river diversion tunnel. Power phases of Folsom are under the USBR. A $2,713,030 contract for three 54,000-kw generators was let in 1950.

Early stage contracts on **Isabella Dam** were let in 1950 for about $5,000,000. These mostly were for road relocation and administration facilities, with work running through 1951. Additional contracts may be let in 1951.

- **Power for California**—Private power companies were furthering work on hydroelectric projects in the Central Valley during 1950. The Pacific Gas and Electric Co. completed $61,000,000 **Feather River** work with 200,000-kw capacity. PG & E started preliminary work on **Bear River Dam** in 1950 with major work to get in full swing this year.

Southern California Edison's $20,000,000 **Big Creek No. 4** power project on the San Joaquin River in central California will be completed by mid-1951, well ahead of schedule. The 84,000-kw capacity of the new power house will bring total capacity of the Big Creek system to 514,000 kw.

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the city of Los Angeles is completing its **Owens Gorge** hydro project. This $42,000,000 job will add 112,500-kw by means of tunnels, penstocks, and power plants that follow a narrow gorge below storage previously built to supply Los Angeles Aqueduct water.

• **Provo River, Utah**—About 38% of a $4,380,000 contract for completion of 6-mi **Duchesne Tunnel** was finished in 1950. The tunnel will account for one-third of the water supply to a project that furnishes domestic and irrigation water to areas between Salt Lake City and Provo.

During last summer, work was completed on final reaches of 41-mi **Salt Lake Aqueduct**, including three small tunnels in Provo Canyon, and a $1,259,940 contract was awarded for construction of a 40-mg, covered, concrete, regulating reservoir at the terminus of the Aqueduct in Salt Lake City. Scheduled completion date for the reservoir is Dec. 19, 1951, and for the tunnel, Feb. 5, 1953.

• **Grand Valley, Colorado** — Emergency realignment of about a half-mile of **Tunnel No. 3**, a vital link in the **Highline Canal**, was accomplished between Mar. 8, 1950—date of the landslide that destroyed the old tunnel—and April 27. Amount of the contract was $609,800. Swift work saved 1950 crops for 30,000 acres of land in the vicinity of Grand Junction, Colorado.

• **Southern California** — Work was started on the $36,000,000 **Whittier Narrows** flood-control project in Los Angeles County. The $3,000,000 spillway and east embankment contract is one-fourth completed. Work estimated at $700,000 will be let in April.

Also in 1950, **Tujunga Wash** flood-control channel work was furthered, with completion of a $1,850,000 contract and awarding of another for $1,664,000. To be awarded in 1951 is a contract estimated at $2,300,000 that will complete the work with complete channelization from **Hensen Dam** to the **Los Angeles River.** On this latter water course, work was completed in 1950 costing about $1,000,000, and an additional $2,300,000 job is due to be let.

• **Columbia River Basin**—The Corps of Engineers had under construction during 1950 two mammoth power projects—McNary and Chief Joseph Dams—both on the Columbia River main stream. First McNary units will go on the line in 1953 and first Chief

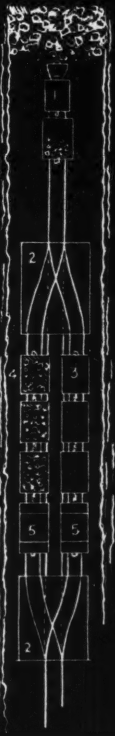
(*Continued on p. 228*)

# CASE HISTORY OF A SUCCESSFUL TUNNEL JOB

## FROM THE EIMCO FILE T64

## CONTINENTAL DIVIDE TUNNEL

The Continental Divide Tunnel (also known as the Alva B. Adams Tunnel) was driven on contract by three different contractors all using Eimco equipment for loading. Total length 13.3 miles, no intermediate openings. Longest contract 42,995 ft. Avg. advance per month for 37 months on longest contract — 1144'.



Interesting facts about this tunnel include: 1,800,000 man hours of labor were required to excavate the 310,000 yards of material, 480 miles of drill holes were required and 1,240 tons of powder were used.

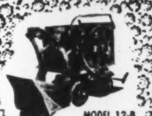
For switching cars at the heading a double track passing switch was built to slide along on top of the permanent track. See illustration at left: 1. Eimco Model 21 Loader. 2. Double track switch mounted on plate to slide on permanent track. 3. Empty cars. 4. Loaded cars. 5. Locomotive.

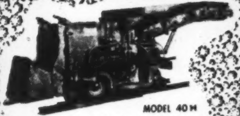
**Successful tunneling is dependent on arriving at a satisfactory cycle of drilling, blasting and mucking, then repeating the cycle as fast and as often as possible.**

**Contractors who have been most successful in working out this formula have been most emphatic in saying that dependable equipment means most in maintaning the pace that pays dividends.**

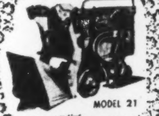
**Eimco equipment for loading is dependable. "It's meant the difference between success and failure on our job," says one superintendent.**

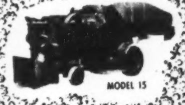
**There's an Eimco Rocker Shovel for every size tunnel and for speed, economy and dependability you can't beat an Eimco.**

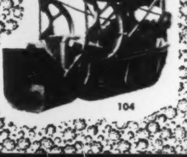

MODEL 12-B


MODEL 40H

102


MODEL 21


MODEL 15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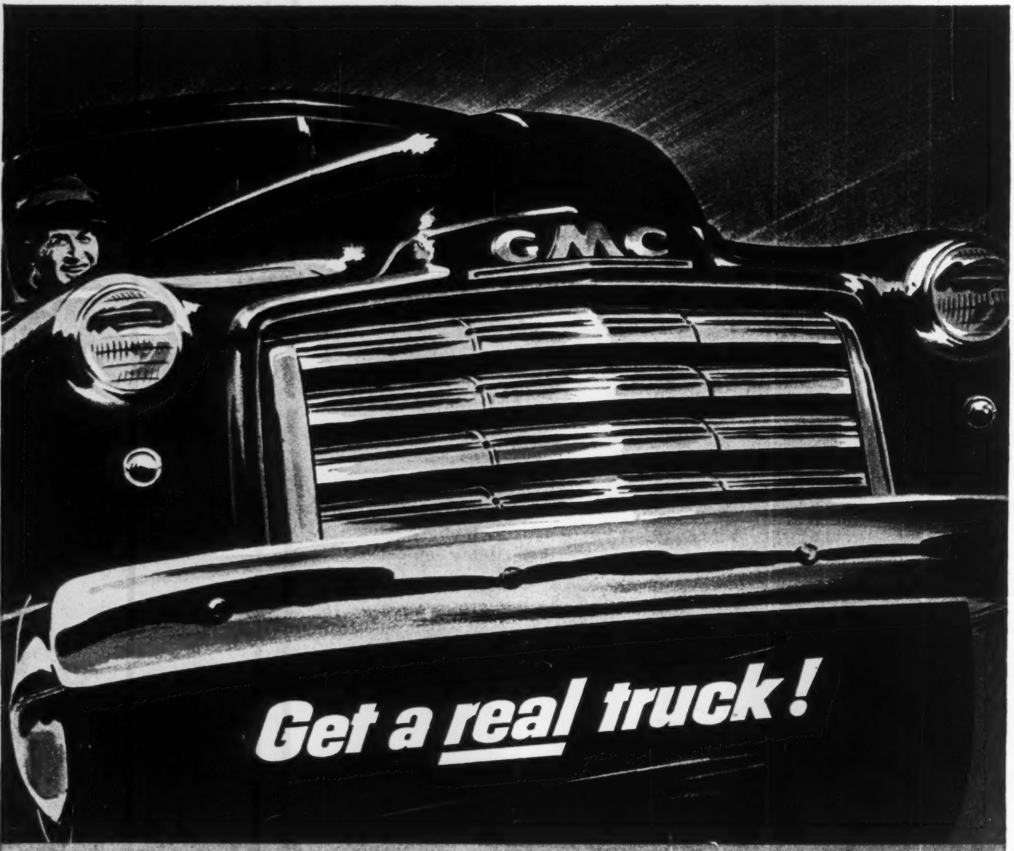

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# LIGHT TRUCKS BY GMC!

## Unsurpassed in horsepower—you've never seen ½- to 2-tonners like these—built for keeps from the rims up with many "big truck" features

THESE new lightweight champs are a lot more than just newly dressed-up models. They're built to carry you through the critical times ahead. To produce them, we threw away the book and started fresh.

### Keep hauling years longer

The moment you put one of these GMC's on the road, you feel the surge of extra power that's turned out by their new engines — horsepower that's *unsurpassed* in the ½- to 2-ton truck field! This extra drive is due to such GMC features as new carburetion design, rotating Free-Valve action in the new "248" engine design that never lets carbon get set to steal power — Turbo-Top pistons that develop higher power without "knock" *even when using standard-grade gasolines!*

Feature upon feature from each individual model tells you these GMC's are built to stay young and free of trouble *from rims to roof.* Things like heavier axles, longer "pillow-action" springs, the protection of a built-in radiator overflow tank—all typify the plus values in these new trucks.

### Greater Safety—More Comfort

Touch the brakes. Feel the "Twin Action" of the wider hydraulics—now included on all 1½- and 2-ton models in this safer line of new light trucks!

Or check for comfort. See how the GMC "Six-Footer" Cab has new Ventipane-controlled ventilation, non-glare instrument panel and easy-turn steering with recirculating ball-bearing action.

### One Package—"No Extras"

*Yet all this GMC extra value is included in one thrifty price!* Feature for feature, no truck in its class has been so completely engineered to meet the challenge of the times.

To prove it, go to your GMC dealer's showroom. Select from the wide variety of models in 9 smart new colors. Compare the unsurpassed horsepower — the tough GMC frame — *the lifetime engineering in every detail.* You'll find one fact stands out above all else:

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*GMC Truck & Coach Division of General Motors*

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In *Preformed* Yellow Strand, whatever the construction, internal stresses have been relaxed. You gain with longer rope life, fewer shutdowns for replacement, more production for your rope dollar. Call your B & B distributor now so you'll have a real *working* rope on hand when it's time to change your hoist, drag, scraper or other heavy-duty line.

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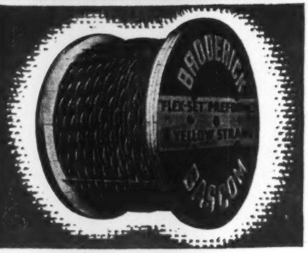
PREFORMED WIRE ROPE



Joseph units in 1956. Both will have power plants with capacities in the neighborhood of 1,000,000 kw.

Final closure at **McNary Dam** was completed in December, and the first vessel passed through the navigation lock, highest single-lift lock in the world. Closure of the spillway, termed the "toughest river diversion in construction history," marked completion of the first step in construction of the $270 million project. Rapid progress was made on the second-step contract, calling for construction of the Oregon shore cofferdam and powerhouse foundation. Contract for the third and final step will be awarded in April, 1951.

First contracts were awarded on **Chief Joseph Dam,** which is between Grand Coulee and McNary Dams. This work included excavation for the powerhouse and intake structure. Total cost of the project, due for completion in 1956, will be $206 million.

Bids were opened in January for the initial contract on **Albeni Falls Dam** on the Pend Oreille River in northern Idaho, and construction is due to start soon on the $31,000,000 project. This relatively small structure will impound 1,140,000 acre-ft, aiding flood control in the Columbia River Basin, firming up downstream generation capacity and permitting installation of 42,600-kw at Albeni Falls.

First concrete was poured on **Detroit Dam,** which is on the North Santiam river. It will cost $70,000,000.

Last year also, the main contract was let for construction of **Lookout Point Dam** on the middle fork of the Willamette. Work scheduled for this year includes railroad relocation and start on the powerhouse structure. Cost is estimated at $84,000,000.

A contract also was let for first construction on **Big Cliff Dam,** a regulating structure three miles down stream from Detroit Dam.

In southern Idaho, **Lucky Peak Dam** on Boise River progressed from preliminary to major construction stages. It will be coordinated with two other dams already built to control flood and irrigate lands. This is a joint project of the Corps of Engineers and Bureau of Reclamation. Its estimated cost is $22,000,000.

An appropriation of $18,000,000 for preliminary work on **The Dalles Dam,** fifth major dam on the Columbia River, was asked in President Truman's budget message. This dam, between McNary and Bonneville dams, near The Dalles, Ore., already authorized by Congress, would cost $326 million and produce 980,000 kw.

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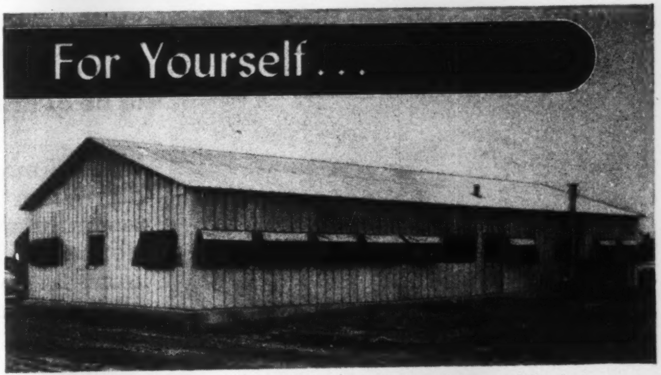

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You'll start to profit *sooner* when you recommend and use Butler Steel Buildings. Fire-safe, weathertight Butler Buildings go up faster with less labor . . . earn you earlier returns when adapted to your customers' needs or your own use. When your customer wants speed and economy and you want a fair profit, Butler Buildings are your answer. Easily insulated, and at low cost.

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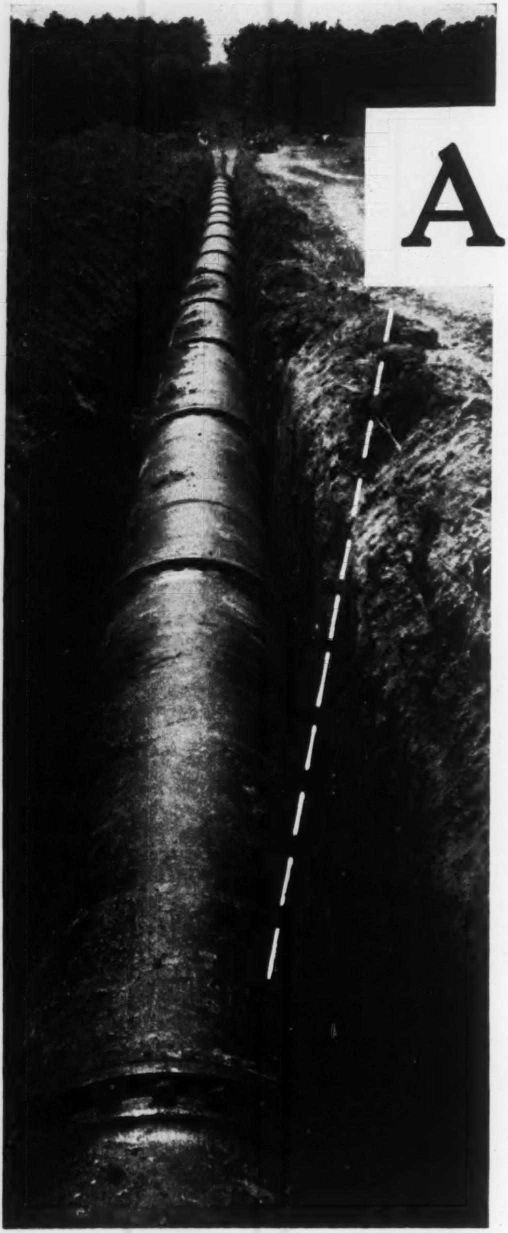

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When you buy anything, you want the best quality you can get for your money. Our trade-mark cast on our products gives you this assurance. The trade-mark "ACIPCO" means the materials used in manufacturing our pipe are warranted to be first class and the workmanship is guaranteed to be of finest quality.

As America's largest individual cast iron pipe foundry, ACIPCO manufactures a complete line of cast iron pipe and fittings in diameters from 3" to 48", inclusive. The pipe which is made by the Mono-Cast centrifugal process is equipped with any of a wide variety of joints including Bell and Spigot, Doublex Simplex, Molox Ball and Socket, Roll-On-Rubber Ring, Screw-Gland, and Flanged. All ACIPCO pipe is manufactured under close control to meet nationally recognized standard specifications.

Being cast iron, ACIPCO pipe enjoys an enviable reputation. Cast iron pipe has had over three hundred years of service abroad and more than one hundred years of service in the United States. It serves equally well beneath crowded city streets or in cross country installations.

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ton of the Bureau of Reclamation's Columbia Basin multi-purpose power and irrigation project, designed to have a total rated power capacity of nearly 2,000,000 kw and to furnish water to more than 1,000,000 acres, is continuing. Installation of the last main generating units is scheduled for this year, and initial irrigation of 87,000 acres is scheduled to start in 1952. After '52, 60,000 acres are scheduled to be placed under irrigation each year. Two of the ultimate installations of twelve 1,350-cfs pumps at the **Grand Coulee** pumping plant will be initially operated in 1951 to fill the system's equalizing reservoir formed in Grand Coulee by **North Dam** and **South Dam.** $110 million worth of contracts are in force.

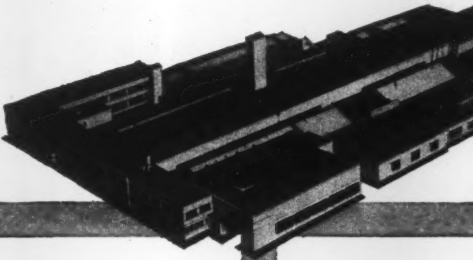
Previously granted contracts still active at the beginning of 1951 include: Construction of **Grand Coulee pumping plant,** installation of discharge pipes, headworks structures, second-stage concrete and miscellaneous construction, $14,070,000; six pumps, $1,315,000 and six 65,000-hp motors, $2,769,000 for the pumping plant; construction of **North Coulee Dam** and feeder canal, $5,168,000; **Soap Lake Siphon,** $7,725,000; construction of the second section of west canal, $6,022,000; construction of earthwork and structures on **Winchester Wasteway,** $1,079,000; construction of second section of **East Low Canal** and **Rocky Coulee Wasteway,** $8,030,000; three generators, $5,250,000, three turbines, $2,534,000, and nine power transformers, $1,037,000 for the right powerplant.

First postwar project in the Northwest to add major quantities of new power will be USBR's **Hungry Horse Dam.** The first two 71,250-kw units are scheduled to be in operation in late 1952 with the entire plant capacity of 285,000-kw available by Nov., 1953. More than 1,000,000 cu yd of concrete went into the 564-ft high dam in 1950. Similar amounts are scheduled for 1951 and 1952. Located on the South Fork of the Flathead River (a Columbia River tributary) in northwestern Montana, Hungry Horse Reservoir will firm up generating capacity at such downstream dams as Grand Coulee and Bonneville. Other work accomplished in 1950 included further clearing operations in the reservoir area.

Another USBR project, the high earthfill **Anderson Ranch Dam** moved nearer final completion in 1950 with the first of three 13,500-kw generating units going on the line. Installation of the other two units in 1951 will virtually complete the project, started in 1941. It included the

*(Continued on p. 234)*

**Haughton Elevator Co.**
**keeps heating costs down...**
**operating efficiency up...**



**1938**
**76,000 sq. ft. plant area, 41 Janitrol unit heaters**

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**170,000 sq. ft. plant area, 59 Janitrol unit heaters**

**12 YEARS PERFORMANCE RECORD SHOWS JANITROL GAS HEATING COSTS LESS...**

**Twelve years ago, Haughton Elevator Company estimated they saved $15,000 by installing Janitrol Unit Heaters instead of a central heating plant, with a yearly fuel saving of 53%.**

**As plant expansion took place, it was easy to add Janitrol heating equipment at low initial cost and without interfering with plant efficiency.**

**Note: In the past year, total heating cost (6,066 degree days) was only $4570.**

**Complete details on the advantages of this Janitrol installation and hundreds of others are available to businesses interested in clean, fast, economical and automatic heat directed exactly where you want it.**

**Quick plant expansions for defense work need not create emergency heating problems. Janitrol Unit Heaters are quickly and economically installed for flexible operation. Write for your copy of "Commercial & Industrial Heating", for a semi-technical description of efficient gas heating installations of all types.**

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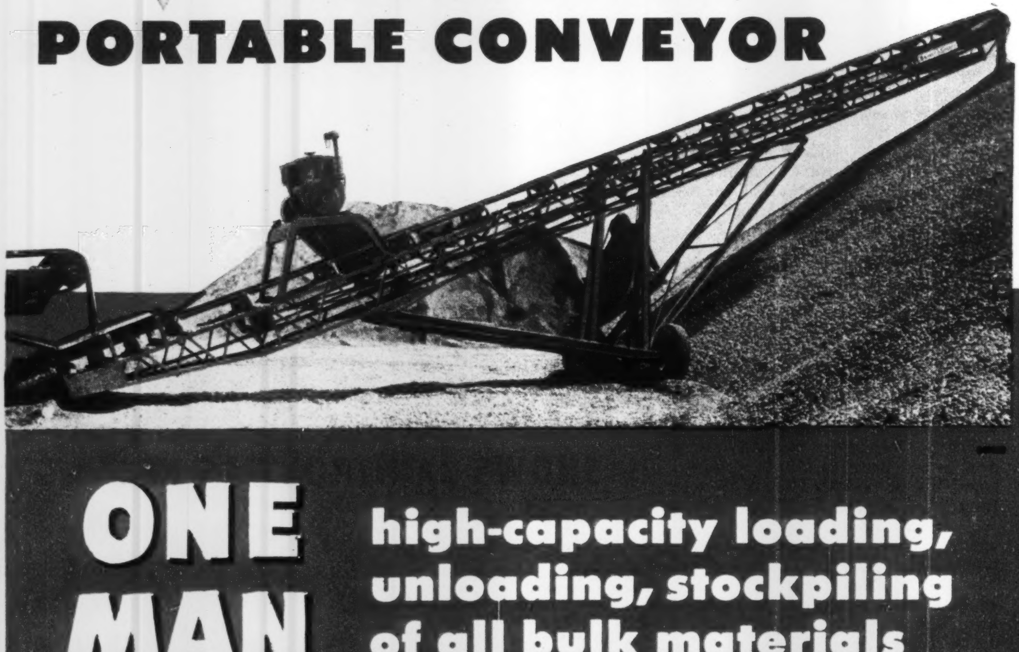
# HEAVY-DUTY LONG-REACH PORTABLE CONVEYOR



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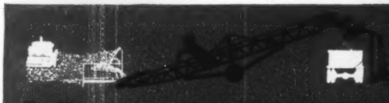
## high-capacity loading, unloading, stockpiling of all bulk materials

**Here is a pneumatic-tired portable conveyor with capacities from 150 to over 425 tons per hour. The B-G 374 can be towed from job to job, pile to pile, and has all the flexibility in use of smaller portable conveyors. It is built for heaviest service, yet one man can operate it to load, stockpile and unload far more tonnage per day than with any other truly portable conveyor. The 374 will handle sand, stone, wet concrete, coal—any bulk material—at a cost so low that every aggregate producer, contractor, City, County or State Highway Department handling large quantities of materials, should get the full details now on this new heavy-duty machine.**

***see your BG distributor***

# Greene

# 150 to 425 TONS/HOUR

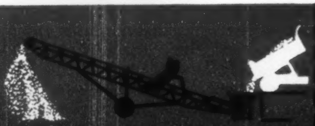


The 374 conveyor can be equipped with vibrating screen to reject over-size while loading or stockpiling.

The 374 is the Heavy-duty Portable. It can build these high extended storage piles to store more material in restricted areas; it can keep up with high production operations such as elevating materials to crushers, surge storage bins, etc.; it can load or unload cars or trucks with new standards for speed and low cost. Combined with over-the-road portability, these factors offer appreciable savings in manpower and operating expense.

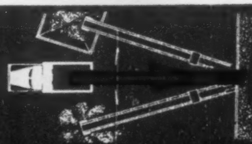
## VERSATILE...

Here are a few examples of what the 374 Conveyor, with its complete line of accessories, including feeders, vibrating screens, discharge spouts, loading hoppers, etc., can do for you in your heavy-duty bulk material handling operations.

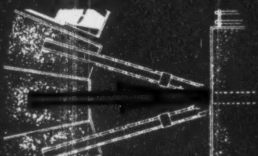


Wide reach and high discharge for high, extended storage piles.

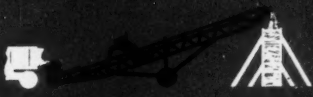
Low mast clearance, heavy-duty antifriction bearing axle, pneumatic tires, for fast over-the-highway towing.



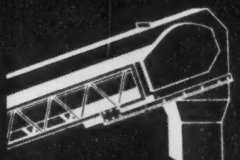
Truck loading, bin charging, or stockpiling without moving the conveyor is possible with the 374 unloading direct from cars.



Swivel wheels allow the 374 Conveyor to swing to load trucks direct or to radial storage.



Equipped with hopper, the 374 can elevate or convey wet concrete direct to forms.



For dry batch transfer, the 374 is equipped with hood to prevent loss of materials in delivery to trucks.

## send coupon for details

Available in belt widths of 18", 24" and 30", in lengths from 30' to 60', the 374 can be invaluable to you in these days of restricted manpower and the need for high production operations. Fill in and send this coupon for your copy of the 374 Bulletin.

**BARBER-GREENE COMPANY**
AURORA, ILLINOIS, U. S. A.

157

Barber-Greene Company
Aurora, Illinois

( ) Send bulletin on 374 Conveyor.

( ) Have representative call.

Name ......................................

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MONEY MAKER

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•SHOOTS STRONGEST CONCRETE FASTER

"Welding with Concrete" best describes the new CMC JETCRETE method of pneumatically applying concrete. JETCRETE is *the most nearly perfect concrete known today*. Wherever and whenever used, JETCRETE has done the job *better, faster—and at lower cost! The machine with a thousand uses!*

- *BUILDING* . . . walls, roofs, partitions, fences, fire retards, etc.
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- *WATERPROOFING* . . . Reservoirs, tunnels, tanks, drains, fissures, water basins, etc.
- *FIREPROOFING* . . . Wood, structural steel . . . buildings and mines, etc.
- *PRESERVING* . . . Brick, concrete, steel, tile, stucco, wood, iron, spillways, turbine chambers, piers, sewers, tunnels, etc.

Write for illustrated bulletin No. JG-348 showing JETCRETE in action.

CONSTRUCTION MACHINERY COMPANIES
WATERLOO, IOWA

USBR's largest rolled-earth fill—more than 9,000,000 cu yd.

Other major USBR work in the Northwest includes highway relocation and reservoir clearing at **Cascade Dam** and preliminary development at **Palisades Dam.** On the **Minidoka** project, six observation wells are to be drilled preparatory to tapping an underground river to irrigate 64,000 acres. **Arnold Diversion Dam** was completed on the Deschutes project.

Seattle's city light department continued development of its **Skagit** hydroelectric project, with $5,000,000 spent there during the year. Largest project was a $3,000,000 addition to the **Gorge** powerhouse, in which a 60,000-kw generator is now being installed and will be in operation this fall. Upstream, work was completed on the $1,000,000 Gorge diversion dam while work was started on a $2,000,000 improvement program at **Diablo Dam** and on a $1,435,000 contract for power tunnels at **Ross Dam.** Bids on a multimillion-dollar contract for construction of the Ross Dam powerhouse were scheduled for opening Feb. 21, 1951. Construction planned for 1951 is estimated to cost $18,400,000, of which $6,000,000 will go for the hydroelectric development, $8,000,000 for transmission facilities and $1,150,000 for distribution facilities.

Idaho Power Company's **C. J. Strike** plant and dam on Snake River (90,000-kw) was started in November. Cost of project, including sub-stations and transmission lines, will be $30,000,000. Bulk of the work will be done this year, with operation expected by mid-1952. The dam is part of the company's $95,000,000 development program.

## Transportation

• **New Hampshire Turnpike**—Built to connect with Maine's Portland-Kittery turnpike, this four-lane 15-mi coastwise border-to-border toll road was opened to traffic June 24, 1950 when a short connection to Massachusetts highway was completed. Cost was $7,500,000.

• **Newburyport Turnpike**—To connect with the New Hampshire Turnpike, this will be a new 4-lane limited-access location of historic Route 1 northward from Boston. First contract, for $4,000,000, was 5% complete Jan. 1, to be completed in Oct. 1952. Additional contracts will be let this spring.

• **Boston bypass**—Running 22.5 mi in an arc west and north of Boston, new route 128 will have limited-access features, will replace a confusing succession of local roads for motorists desiring to by-pass Boston. Built under nine contracts totaling $17,800,000 the public highway was 60% complete Jan. 1, will be ready for traffic in November.

• **Boston vehicular projects**—Three projects under construction Jan. 1 will improve Boston's traffic situation. The first is the **East Boston Expressway,** a two-mile elevated and at-grade route to connect Sumner Tunnel with northeastern suburbs and Logan airport. Begun in 1948, the work includes two contracts. Total: $8,300,000. Completion date is October 15, 1952. Northwest of Boston's center, at **Sullivan Square,** a $4,800,000 job is under way to eliminate a crossing of two main traffic routes. Work includes an underpass, two overpasses, a traffic rotary, a pedestrian overpass and two bridges over railroads. Begun in January 1950, work is scheduled for completion in June 1952. The **Boston Central Artery** promises to be the city's greatest single traffic improvement. The artery will be an elevated highway connecting the congested in-town North Station area with Cambridge, to the northwest. In addition there will be connections with Em-

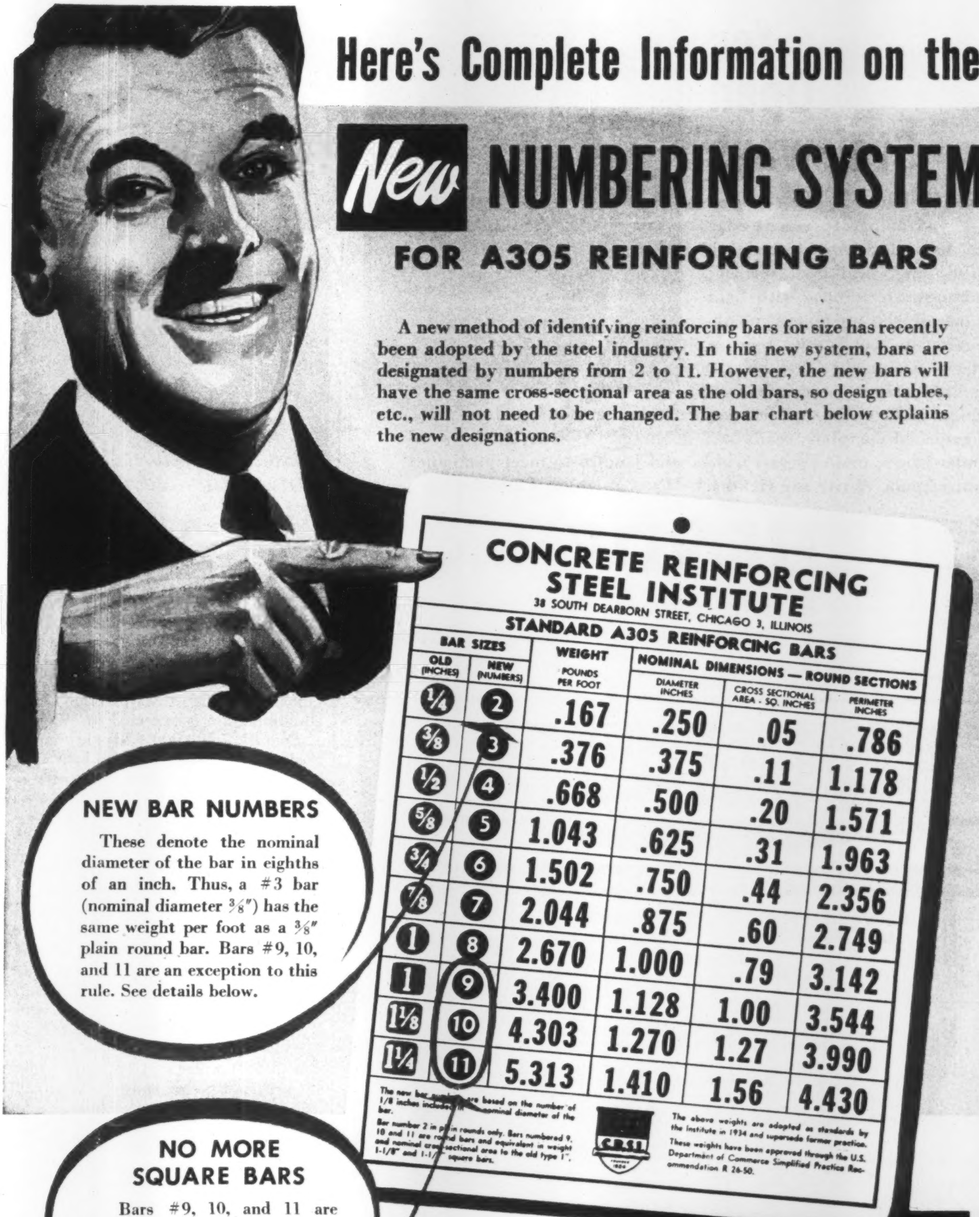
**CALIFORNIA INTERCHANGE—Four-level connection of Hollywood, Harbor, Arroyo Seco and Santa Ana expressways.**

# Here's Complete Information on the

# New NUMBERING SYSTEM

## FOR A305 REINFORCING BARS

A new method of identifying reinforcing bars for size has recently been adopted by the steel industry. In this new system, bars are designated by numbers from 2 to 11. However, the new bars will have the same cross-sectional area as the old bars, so design tables, etc., will not need to be changed. The bar chart below explains the new designations.



**CONCRETE REINFORCING STEEL INSTITUTE**
38 SOUTH DEARBORN STREET, CHICAGO 3, ILLINOIS

**STANDARD A305 REINFORCING BARS**

| BAR SIZES | | WEIGHT | NOMINAL DIMENSIONS — ROUND SECTIONS | | |
|---|---|---|---|---|---|
| OLD (INCHES) | NEW (NUMBERS) | POUNDS PER FOOT | DIAMETER INCHES | CROSS SECTIONAL AREA - SQ. INCHES | PERIMETER INCHES |
| ¼ | 2 | .167 | .250 | .05 | .786 |
| ⅜ | 3 | .376 | .375 | .11 | 1.178 |
| ½ | 4 | .668 | .500 | .20 | 1.571 |
| ⅝ | 5 | 1.043 | .625 | .31 | 1.963 |
| ¾ | 6 | 1.502 | .750 | .44 | 2.356 |
| ⅞ | 7 | 2.044 | .875 | .60 | 2.749 |
| 1 | 8 | 2.670 | 1.000 | .79 | 3.142 |
| 1 | 9 | 3.400 | 1.128 | 1.00 | 3.544 |
| 1⅛ | 10 | 4.303 | 1.270 | 1.27 | 3.990 |
| 1¼ | 11 | 5.313 | 1.410 | 1.56 | 4.430 |

The new bar numbers are based on the number of 1/8 inches included in the nominal diameter of the bar.

Bar number 2 in plain rounds only. Bars numbered 9, 10 and 11 are round bars and equivalent in weight and nominal cross-sectional area to the old type 1", 1-1/8" and 1-1/4" square bars.

CRSI
1924

The above weights are adopted as standards by the Institute in 1934 and supersede former practice.

These weights have been approved through the U.S. Department of Commerce Simplified Practice Recommendation R 26-50.

**NEW BAR NUMBERS**

These denote the nominal diameter of the bar in eighths of an inch. Thus, a #3 bar (nominal diameter ⅜") has the same weight per foot as a ⅜" plain round bar. Bars #9, 10, and 11 are an exception to this rule. See details below.

**NO MORE SQUARE BARS**

Bars #9, 10, and 11 are round bars equivalent in weight and nominal cross-sectional area to the former 1", 1⅛", and 1¼" square bars.

**Write for Your FREE Copy of this New Bar Card**

**CONCRETE REINFORCING STEEL INSTITUTE • 38 S. Dearborn St., Chicago 3**

for Open Stairways

Hendrick Shur-Site Treads give these advantages: square-edge steel bars that provide a level, non-slipping walking surface; minimum interference with light because of 90% open area; no obstruction to ventilation; a heavy flanged nosing-bar that makes edge of each step conspicuous; strength and rigidity of Mitco construction that assures long service.

Furnished complete, ready to bolt directly to stair stringers; in standard sizes, or in special widths and lengths to meet particular requirements. Write for Hendrick Mitco Products Catalogue.

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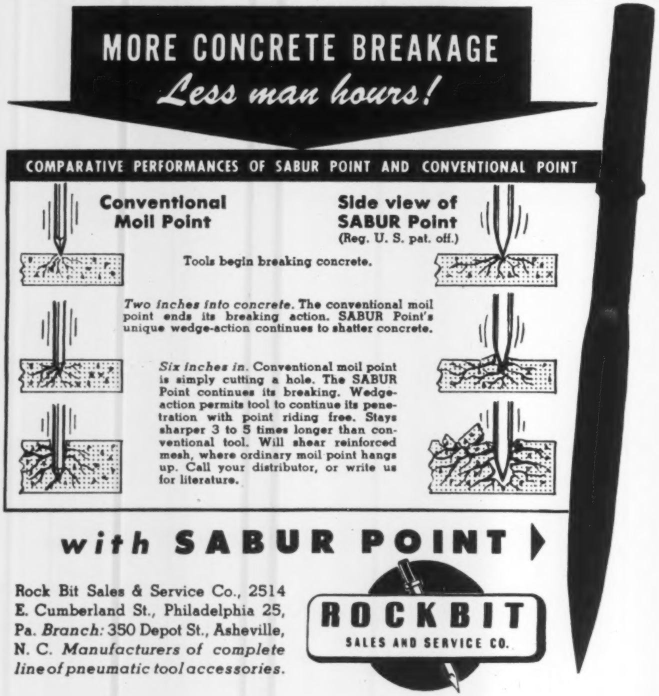


MORE CONCRETE BREAKAGE
Less man hours!

COMPARATIVE PERFORMANCES OF SABUR POINT AND CONVENTIONAL POINT

Conventional Moil Point

Side view of SABUR Point (Reg. U. S. pat. off.)

Tools begin breaking concrete.

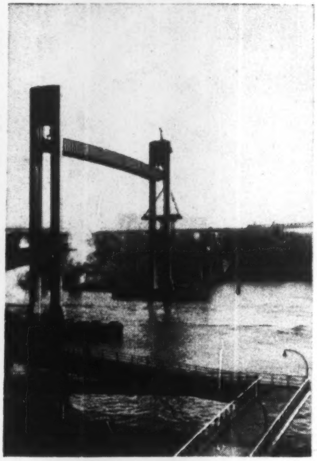
*Two inches into concrete.* The conventional moil point ends its breaking action. SABUR Point's unique wedge-action continues to shatter concrete.

*Six inches in.* Conventional moil point is simply cutting a hole. The SABUR Point continues its breaking. Wedge-action permits tool to continue its penetration with point riding free. Stays sharper 3 to 5 times longer than conventional tool. Will shear reinforced mesh, where ordinary moil point hangs up. Call your distributor, or write us for literature.

with SABUR POINT

Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Pa. *Branch:* 350 Depot St., Asheville, N. C. *Manufacturers of complete line of pneumatic tool accessories.*

ROCKBIT
SALES AND SERVICE CO.



**FOOTBRIDGE—World's longest plate-girder lift span is feature of Harlem River pedestrian bridge in New York.**

bankment Road on the Charles River's south side (westward) and with the Mystic River Bridge (northeastward). Final cost will be $40,000,000. Two contracts, both for a bridge across the Charles River, were let in 1950 at a cost of $1,275,000. Work began in January, for August completion. Overall completion is expected in 1952.

The $27,000,000 **Mystic River Bridge** was opened to traffic in March 1950. All projects but Mystic River Bridge are handled by the Massachusetts Department of Public Works.

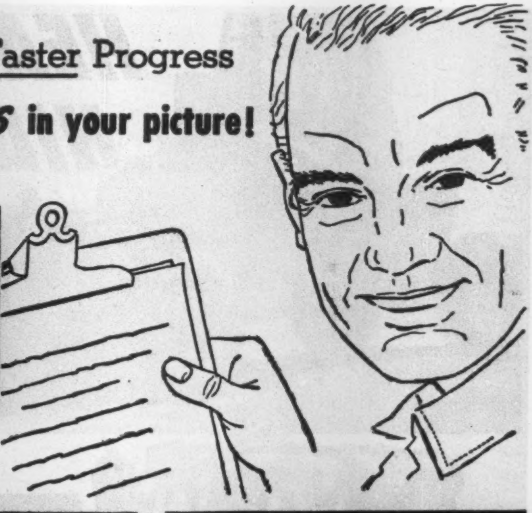
• **Triborough project (N. Y.)**—The foregoing projects are handled by the New York State Department of Public Works. The Triborough Bridge and Tunnel Authority opened its $80,000,000 **Brooklyn-Battery Tunnel** May 25, 1950. And now complete (March 1951) is the **Wards Island Pedestrian Bridge** crossing the Harlem River between Manhattan and Ward's Islands. Construction began late in 1949. The bridge's 312-ft plate girder lift span was placed early in January.

• **Port of New York Authority**—Three other vehicular projects are the responsibility of PNYA: (1) **179th St. Tunnel,** an improvement of the New York approach to George Washington bridge costing $8,400,000, includes a half-mile two-lane tunnel paralleling an existing tunnel. Work began in 1949, was 70% complete early in 1951, for late-year completion. (2) **Holland Tunnel Exit Viaduct,** a $3,200,000 elevated 4-lane route in Jersey City that will take two-way load off the present single-viaduct New Jersey

(Continued on page 239)

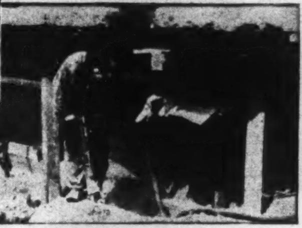
# Progress Reports Reveal Faster Progress

# when *Gardner-Denver's* in your picture!



***Air pressure's always up*** **—when Gardner-Denver Portables feed your lines. Cylinders are water-cooled *all* the way down for all weather efficiency—compressors are two-stage for any altitude performance.**

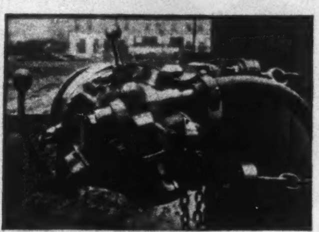
***Holes are spotted quickly*** **—drilled fast and clean with Gardner-Denver Wagon Drills.**



***Demolition proceeds at a steady pace*** **—Gardner-Denver Breakers are easy on the operator—tough on concrete.**

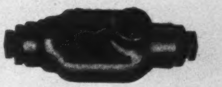
***A clean hole drills faster*** **— and Gardner-Denver Sinkers are noted for hole cleaning ability, powerful rotation.**

***Packs backfill swiftly and firmly*** **—Gardner-Denver Tampers are easy to hold—seldom require maintenance—non-freezing.**



***For speedy pull and haul*** **—powerful Gardner-Denver Air Hoists are easy to control.**

***Clay or hardpan doesn't waste time*** **—when tackled with Gardner-Denver Clay Spaders and Trench Diggers.**



***Saves shop time for all pneumatic tools*** **—L012 Automatic Oiler shuts off air when it runs out of oil.**

***Keeps water out of your way*** **—Top-Suction VP4 Sump Pump won't burrow in the mud—keeps grit out of the pump shaft seal.**

**Write for further information.**

**SINCE 1859**

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**THE QUALITY LEADER IN PUMPS, COMPRESSORS AND ROCK DRILLS**

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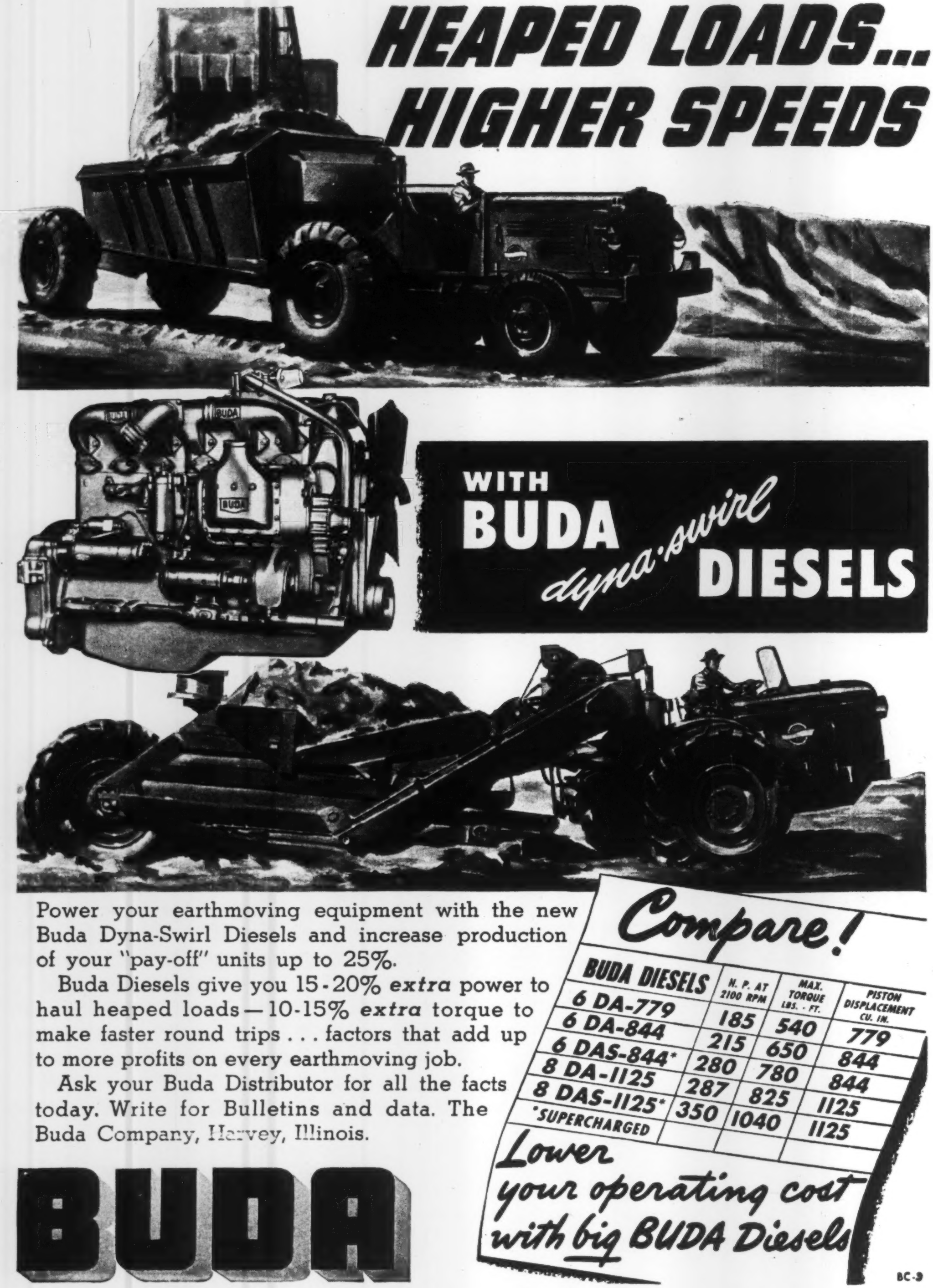
# HEAPED LOADS... HIGHER SPEEDS



## WITH BUDA *dyna-swirl* DIESELS

Power your earthmoving equipment with the new Buda Dyna-Swirl Diesels and increase production of your "pay-off" units up to 25%.

Buda Diesels give you 15-20% *extra* power to haul heaped loads—10-15% *extra* torque to make faster round trips . . . factors that add up to more profits on every earthmoving job.

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## *Compare!*

| BUDA DIESELS | H. P. AT 2100 RPM | MAX. TORQUE LBS. - FT. | PISTON DISPLACEMENT CU. IN. |
|---|---|---|---|
| 6 DA-779 | 185 | 540 | 779 |
| 6 DA-844 | 215 | 650 | 844 |
| 6 DAS-844* | 280 | 780 | 844 |
| 8 DA-1125 | 287 | 825 | 1125 |
| 8 DAS-1125* | 350 | 1040 | 1125 |
| *SUPERCHARGED | | | |

*Lower your operating cost with big BUDA Diesels*

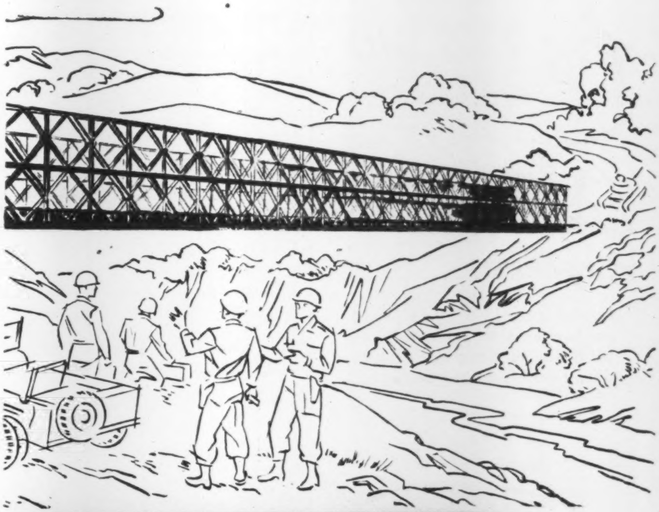
BC-3

**RAIL TUNNEL is the principal structure of a Norfolk & Western Ry. line change in West Virginia.**

approach to Holland Tunnel, is substantially complete. (3) **New Jersey Turnpike connections** costing $3,300,000 will tie that new route in with PNYA's Lincoln Tunnel. At the end of 1950 $365,000 in contracts had been awarded for this connection product.

• **New Jersey Turnpike**—Most of the work on New Jersey's 118-mile toll turnpike is under contract. Grading and drainage work is 65% complete and 70 miles are ready for paving work. All paving, which is to be a high-type asphaltic concrete on specially prepared bases and sub-grades, is under contract and a small amount is under way. The major structures—the large river crossings—are 30% complete. Minor structures—stream crossings and over passes—are 20% complete. All steel for the large bridges had been ordered previous to June 25, 1950, and no serious delays in delivery are expected. The Turnpike Authority expects to have the highway ready to be opened to traffic by Nov. 15 of this year. Landscaping and work at the service stations and concession areas will not be completed until some time in 1952. Estimates now put the cost at $240 million.

• **Philadelphia bridges**—These include two: **Penrose Avenue Bridge** (by Pennsylvania Department of Highways) and **Walnut Lane Bridge** (by City of Philadelphia). Penrose Avenue is in southwest Philadelphia; overall length is 8,780 ft, including a 1,360-ft cantilever bridge over Schuylkill River. On Jan. 1 the $11,900,000 job was 80%



the steel you ordered yesterday
is part of an Army bridge today

**A minor engineering miracle of World War II — and being used again by U. S. Army Engineers — is the Bailey Bridge. Bailey Bridges are portable spans that can be erected quickly and easily across a river or canyon. They are large enough and tough enough to transport almost any Army vehicle. Yet, they "knock down" into small sections and can be moved from one area to another.**

**Bailey Bridges are fabricated from structural steel — a lot of it — by International. As a consequence, much of International Steel Company's normal production facilities for fabricating structural steel is now engaged in this work.**

**But International Steel recognizes, too, that it has a responsibility to its civilian customers. Everything is being done to help fill the structural steel needs of the organizations who helped International to grow.**

**When you need structural steel — think of International . . . we'd like to be of "service."**

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Yes, I'm a Construction Engineer...

I build wooden bridges — and for longer life, trouble-free service, I always build with decay-and-termite resistant...

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- CHEMONITE was developed by University of California Scientists.
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BAXCO
TIMBER·POLES·TIES·LUMBER
CHEMONITE

complete toward summer 1951 opening. Walnut Lane is a prestressed-bridge pioneer that has received much attention. Opened in February, 1951, it has 13 prestressed main span girders 160 ft long and weighing 150 tons each.

• **Pennsylvania Turnpike**—Big 1950 news in this modern "first" among toll roads was its extension on Nov. 20 eastward 100 mi from Carlisle to the vicinity of Philadelphia; cost: $75,000,000. And under construction, 43% complete Jan. 1, was the westward extension running 67 mi from east of Pittsburgh to the Ohio line. This $70,500,000 project is expected to open Nov. 1, 1951.

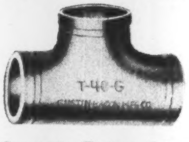
• **Penn-Lincoln Parkway** — Thirteen contracts, covering 7 mi of Pittsburgh's limited-access artery from eastern suburbs to the city's heart, had been let between the first of 1948 and the end of 1950. For the time being no more work is planned. Totaling $33,800,000 in value, on Jan. 1, 1951 the work was 70% along toward June, 1952 completion. $6,300,000 was obligated in 1950.

• **Delaware Memorial Bridge**—Vital to New Jersey Turnpike's success, this $34,300,000 four-lane structure crosses the Delaware at the turnpike's lower end, below Wilmington. Work was 85% complete in January. Cable-spinning for the suspension bridge portions of the 3½-mi project was 65% complete Jan. 1. Opening is scheduled in July, 1951.

• **Chesapeake Bay Bridge**—To cross more than 4 mi of open water, this $44,000,000 two-lane bridge project near Annapolis got under way in 1949 with $37,500,000 of contract awards (42% progress Jan. 1, 1951); it will be completed in mid-1952. The job includes 123 spans, ranging from 60 ft to 1,600 ft, the latter being a suspension span affording 186-ft channel clearance 1,500 ft, the latter being a suspension span affording 186-ft channel clearance 1,500 ft wide. Project length is 7.7 mi including the approaches.

• **Annapolis-Washington Expressway**—This 28.4-mi double-barreled route eventually will carry Chesapeake Bay Bridge traffic from Revell, Md. to the District of Columbia line. Work also includes a 2-mi spur to Annapolis. Of $29,500,000 overall cost, $11,265,000 has been authorized to date of Jan. 1, 1951 for 9.8 mi at the eastern end. This work was 53% complete Jan. 1, 1951. Of the remaining portion 6.6 mi is expected to be advertised in 1951, leaving 12.0 mi from U. S.

NEW
LINE OF
GROOVED
PIPE FITTINGS!



New Gruvagrip Fittings for grooved pipe are now available at your local supply store — a complete line of malleable fittings, including L's, T's, crosses, laterals, reducers, bull plugs and adapter nipples!

New Gruvagrip Fittings come in sizes ¾"-12" and withstand the same working pressures as the Gruvagrip Couplings with which they are used. Each Gruvagrip Fitting carries a permanent size and identification mark and is painted inside and out with rust-inhibiting paint.

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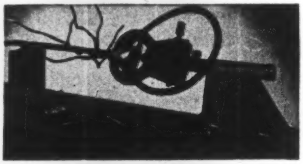

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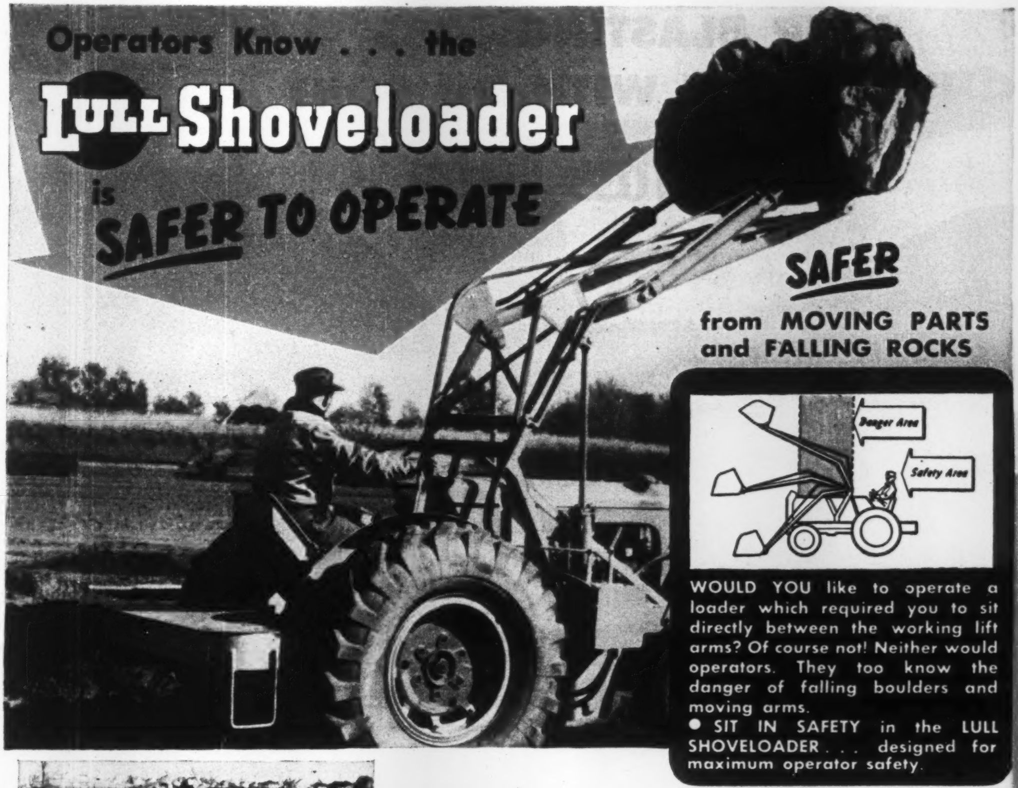

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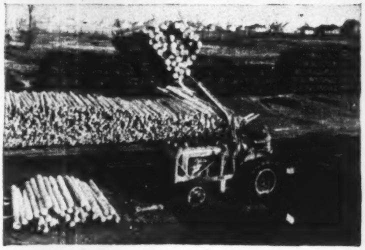
WOULD YOU like to operate a loader which required you to sit directly between the working lift arms? Of course not! Neither would operators. They too know the danger of falling boulders and moving arms.

- SIT IN SAFETY in the LULL SHOVELOADER . . . designed for maximum operator safety.

**OPERATORS KNOW** their position on a loader is important to their safety. On a LULL SHOVELOADER, they know they are well clear of moving arms and falling rocks. They know they have full freedom of movement without fear of the giant they operate.

**OPERATORS ARE CONFIDENT** in the SHOVELOADER'S safe, versatile operation. They like its safer lifting, loading, scraping, bulldozing, digging and transporting. Accidents cost man hours, law suits, and increase insurance rates. Get the facts about LULL SHOVELOADER'S safety today!



**THE LULL LOG LIFTING FORK,** like all other LULL attachments, has the same LULL safety design as the SHOVELOADER. Even with the high lift of the lifting fork, the operator is well clear of falling logs and moving arms. Log stacking can be dangerous but not with a LULL LOG LIFTING FORK.

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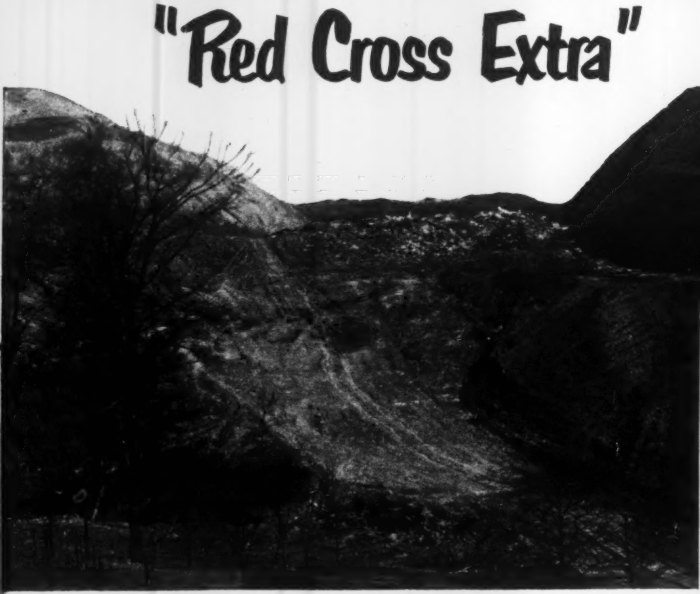
# KEEP BLASTING JOBS ON SCHEDULE WITH DU PONT "Red Cross Extra"



Typical open-cut excavation along railroad right of way. Here, dependability and water-resistance of "Red Cross Extra" aid the contractor in keeping the job running smoothly.

Loading "Red Cross Extra" 50% in wagon drill holes on slopes of railroad open cut.

**PROBABLY THE BEST-KNOWN** all-around explosives, Du Pont "Red Cross Extra" Dynamites are widely used by contractors throughout the country to help maintain schedules. On job after job, these water-resistant explosives prove their efficiency, economy and dependability.

**CONTRACTORS CHOOSE** "Red Cross Extra" Dynamites because they are economical . . . less sensitive to shock and friction . . . less flammable. In addition, these grades have sufficient water-resistance to meet requirements on many construction projects.

**"RED CROSS EXTRA"** facilitates the speedy, economical removal of rock. These popular dynamites are available in various strengths ranging from 15 to 60 per cent. Your Du Pont Explosives representative will be glad to give you complete information on these and on dependable Du Pont blasting supplies and accessories. Call on him before your next blasting job.

E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Del.

## DU PONT EXPLOSIVES

*Blasting Supplies and Accessories*

DU PONT

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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Route 301 to the District of Columbia line undetermined.

**New York Thruway**—Contracts amounted to $17,500,000 for 69 mi of construction on this trans-state route program. (1949 mileage was 11 mi). Work in 1950 included nine bridges, 10 highway grade separation structures, three railroad grade separation structures and paving of 44.8 mi of the Thruway. The largest single paving contract was for 20.27 mi of twin 25-ft-wide arteries on a section near Syracuse, costing $2,892,816.25.

**New York State Parkways**—Total contracts amounted to $8,600,000 for 20 mi of construction. **Palisades Interstate Parkway:** 6.89 mi of grading in Rockland and Orange counties. **Northern** and **Southern State Parkways:** 17.08 mi of traffic divider installed in Nassau County. **Captree State Parkway** (Long Island): 2.43 mi of construction. **Northern Sagtikos Parkway** (Long Island): 17.27 mi of construction, including access road.

**New York City major routes**—Total contracts were $21,000,000. Included 19 bridges, two railroad grade separation structures. Four contracts on **Bronx River Parkway Southern Extension** totalled $3,100,000 for 4.52 mi of paving and miscellaneous work; a railroad grade separation structure and a pedestrian underpass. **Major Deegan Expressway** (Bronx): Two contracts totalling $5,400,000: Covered restoration of Van Cortlandt Park golf course, 1.26 mi.; 0.36 mi from Bronx Terminal Market to Macombs Dam Bridge and a grade separation structure over N. Y. Central Railroad, with access ramps. **Cross Bronx Expressway:** Two contracts totalling $3,200,000. Highbridge Interchange; construction of two viaducts; pedestrian underpass; work on two other viaducts and paving of interchange with reinforced concrete. Lighting also included. **Brooklyn-Queens Expressway:** Four contracts totalling $3,700,000. Two mi of paving, electrical signs and construction of Williamsburg and Meeker Avenue viaducts with 0.54 mi of paving.

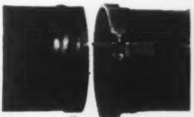
- **Baltimore-Washington Expressway**—A modern substitute for U. S. Route 1, this limited-access route is a project of the State of Maryland and the Federal Government. Maryland's 10.2-mi main-line share, plus 8.2 mi connections, is to cost $14,500,000; $12,183,000 of which is completed or under contract to date of Jan. 1, 1951. Two contracts remain to be awarded in 1951. January 1, 1951 overall progress was 57% toward late 1951 completion. The Government's share, 18.5

A Hammer is all
You need...
to Install NAYLOR Pipe
with NAYLOR
Wedge-Lock Couplings

**Just 4 Simple Steps**
**Do the Trick**

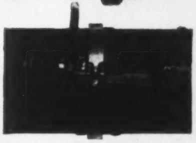
1

**Use hammer to drive wedge into the two parallel lugs to open coupling.**



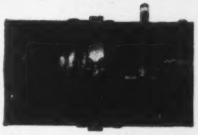
2

**Slip coupling over pipe end and put next joint of pipe in place.**



3

**Drive out opening wedge so coupling snaps into place on grooved ends of pipe.**



4

**Drive wedge home into the three lugs on coupling.**

It's a simple matter to install Naylor large diameter pipe with Naylor Wedge-Lock couplings—on high or low pressure air and water lines, ventilating lines, dredging lines, and other piping required in construction service.

These one-piece, positive type couplings slip into the grooved ends of Naylor pipe, providing a tight, leakfree joint. And a hammer is the only tool needed to assemble or disassemble the line.

Lines can be made up with only one side of the pipe in the open. When uniform lengths of pipe are used, replacements of joints can be made at any point without disturbing the balance of the line.

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Concrete Vibrators Since 1931

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mi, has been graded and drained for 6.5 mi at $2,000,000. The remainder of work, including surfacing, will cost an additional $11,000,000. Congress has authorized $4,500,000 for resumption of work on the government's portion.

• **Washington, D. C.**—East Bridge across the Potomac River adjacent to the old 14th St. Bridge was opened in May, 1950, completed in August. Cost $5,800,000. Lenth: 2,430 ft including a twin-leaf bascule span. It is planned to put a similar bridge in place of the old 14th St. truss structure about 1960.

• **Blue Ridge Parkway**—Contracts under way and scheduled for award in 1951 will increase paved length of this U. S. Bureau of Public Roads project (for National Park Service) from 254 to 323 mi. It then will be possible to follow the route from Shenandoah National Park in Virginia to Asheville, N. C., with four gaps in which state roads must be used.

• **York River Bridge**—Outstanding feature of this $9,000,000 highway toll structure in Virginia is a pair of 500-ft swing spans in tandem, which provide one 450-ft wide channel opening and two half that size. On Jan. 1 the substructure was 60% complete, superstructure, 10%, based on at-site progress. River caissons are tallest ever floated to place: one draws 32 ft; total height 110 ft. Overall bridge length is 3,750 ft.

• **Norfolk-Portsmouth Bridge and Tunnel**—The bridge portion crosses the East Branch of the Elizabeth River; the tunnel crosses the South Branch. Together they will connect two of the East Coast's important naval facilities, eliminating a ferry crossing. On Jan. 1, the bridge was 35% complete, the tunnel, 25%. Tunnel includes 2,117 ft of sunken-tube sections, 2,133 ft of cut and cover. Bridge is 2,135 ft between abutments. Connecting land transition link in Berkeley, Va. is about 1,500 ft long. Completion is expected in 1952. Cost is about $18,500,000.

• **Tampa Bay Bridge**—Construction on this $17,000,000 15.12-mi two-lane crossing of Tampa Bay's (Fla.) mouth began in September with contracts amounting to $1,400,000. Termini are Maximo Point in St. Petersburg and a point 4 mi northeast of Bradenton. Bridge will consist of six divisions of hydraulic fill in bay, connected by five main structures of concrete-pile trestle or steel. Structures will be fixed, low-level, except at a twin-leaf

(*Continued on page 246*)

# Here's how PORTAGRAPH has helped other engineers MEET EMERGENCY PRODUCTION

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LEVER LOCK . . . enables operator to remove blade from cut, then lower to same cutting depth without changing adjusting screw.

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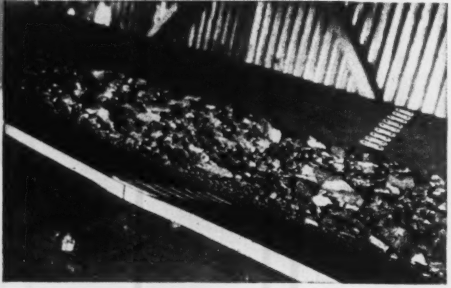

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bascule a mile out of St. Petersburg and at the main channel crossing. The latter, near mid-project, will have as its major feature a 1,584-ft cantilever bridge with 800-ft horizontal, 150 vertical clearance. Completion may be reached in 1953.

• **Cleveland (Ohio) Bridges**—Contracts for the construction of the second of seven railroad bridges to be replaced over the Cuyahoga River, under a joint program by the railroads and the Corps of Engineers, were awarded last year. This $1,700,000 New York Central structure contains a single-track 260-ft vertical lift span with a maximum 98-ft clearance above water. Substructure work will be finished this May and the entire project by February 1952. Next in priority of construction—based on its "nuisance value" to navigation—is a second New York Central bridge. Originally this structure was planned for twin single-track bridges, but present plans are to make it one single-track bridge, with provisions for reverse signaling. The awarding of construction contracts this year will depend upon availability of materials and funds.

• **Cleveland, Ohio**—Contracts totaling $1,200,000 were awarded last year for an additional 0.8-mi of **Willow Freeway.** Expressway construction on the **East Memorial Shoreway** includes $6,700,000 of contracts awarded last year for 1.65 mi to be completed next year; and 2.5 miles to be awarded this year at an estimated cost of $4,250,000. Completion of these three projects—for which the right-of-way cost $2,900,000—will provide 20.5 mi of completed expressways in the Cleveland Metropolitan Area, an amount representing a total investment of $43,000,000 including $9,900,000 for right-of-way.

• **Toledo, Ohio**—No construction has been started nor right-of-way purchased for Toledo's $62,000,000 urban expressway program. Studies are being advanced, however, and a contract for the first of two bridges over the Maumee River may be awarded this year. This $11,000,000 low-level structure will carry two 26-ft roadways separated by a 4-ft median, and two 5-ft sidewalks. It will be 4,305 ft long, containing one 305-ft bascule span; 1,540 ft of river spans; and 2,460 ft of approach spans.

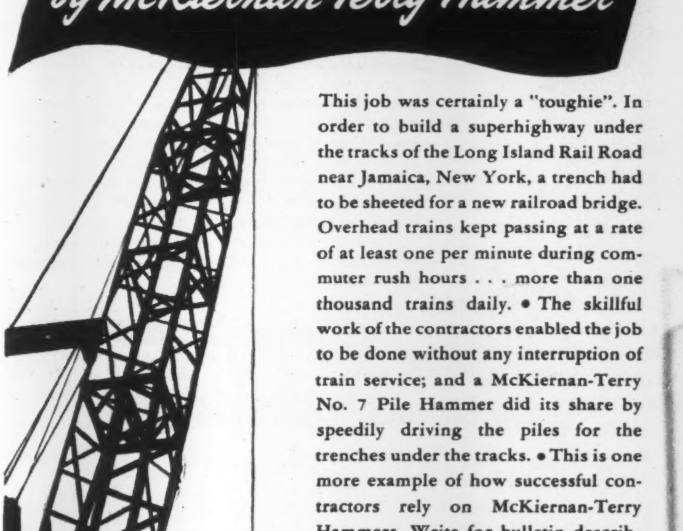
• **Detroit expressways**—The first 0.6 mi of the **John C. Lodge Expressway** has been completed by the Wayne County Board of Commissioners, and an additional 1.0 mi will be finished this year. Virtually all of the $8,100,000 of right-of-way has been bought for the 3.6 mi project. Last year's program included $3,400,000 of work awarded and $6,900,000 completed. An additional $4,000,000 will be started this year. Much of the work to date has been on structures. It includes: 7 bridge structures, 6 pumphouses, 2 tunnels and related water mains, and 10 underground utility relocations. The Michigan State Highway Department completed 11 structures and 1.9 mi of the **Edsel Ford Expressway** last year, and will finish an additional 0.5 mi this year. A total of $4,500,000 of construction was awarded last year; $3,600,000 was completed, and $6,500,000 of work will be awarded this year. To date, $12,900,000 of right-of-way has been purchased for the 5.5 mi project, with $4,000,000 worth remaining to be acquired.

- **Chicago, Ill.**—The Department of Subways and Superhighways spent $17,000,000 last year including: $3,500,000 for subway work; $2,800,000 for superhighway construction; $9,900,000 for right-of-way; and $800,000 for payroll expenditures. This year the department will spend $6,000,000 on superhighways; $2,000,000 for subway construction; $8,000,000 for superhighway right-of-way; and $900,000 for payroll. The 3.85-mi Milwaukee-Dearborn-Congress St. Subway will be completed early this spring at a total cost of $39,600,000. It will funnel traffic from the northwest area of the city into the Loop: connecting eventually with the Congress Street Superhighway. The city's superhighway construction is being concentrated on **Wacker Drive Extension**, the **Congress Street Superhighway** (extending west), and the **North Route** (an extension of the present Lake Shore Drive from Foster to Hollywood Ave.).

- **Chicago bridges**—Although a number of bridges are in urgent need of replacement, shortage of motor fuel tax will prevent start of this work in 1951. This year's program totaling $2,800,000 will cover chiefly the rehabilitation and redecking of 9 major bridges and continuation of construction on three others: (1) The **Congress Street** twin bridge carrying a total of 8 lanes of traffic over the South Branch of the Chicago River—now 7% finished, the $3,000,000 project is scheduled for completion in 1953; (2) Widening of the 36-year old **West Irving Park Road Bridge** from 36-ft roadway to two 32-ft roadways, and two 7-ft sidewalks, to be completed this summer; and (3) the **North Laramie Avenue** underpass carrying seven railroad tracks over a new street to be opened and lowered into a depressed section between rigid-frame

TOUGH JOB MADE EASIER
*by McKiernan-Terry Hammer*

This job was certainly a "toughie". In order to build a superhighway under the tracks of the Long Island Rail Road near Jamaica, New York, a trench had to be sheeted for a new railroad bridge. Overhead trains kept passing at a rate of at least one per minute during commuter rush hours . . . more than one thousand trains daily. • The skillful work of the contractors enabled the job to be done without any interruption of train service; and a McKiernan-Terry No. 7 Pile Hammer did its share by speedily driving the piles for the trenches under the tracks. • This is one more example of how successful contractors rely on McKiernan-Terry Hammers. Write for bulletin describing the entire line of 15 sizes of pile hammers and 2 sizes of extractors.



McKiernan-Terry No. 7 Pile Hammer driving sheet steel piles for trench at the Van Wyck Expressway—L.I.R.R. crossing on Long Island, N. Y. Arthur A. Johnson Corporation and Mason & Hanger Company, Inc. were the contractors.

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TRANSFER BRIDGES

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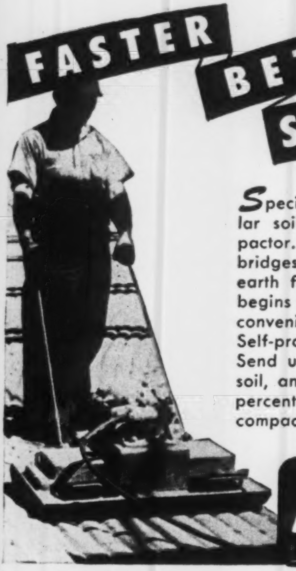

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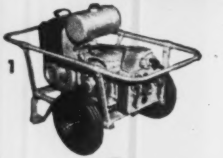
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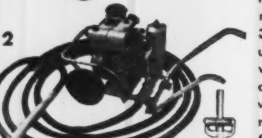
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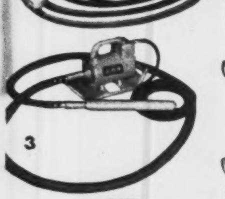
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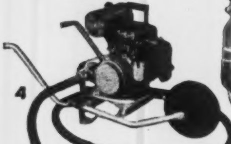
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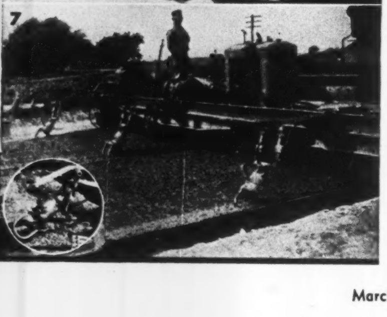
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abutments and approach retaining walls. The substructure is finished but delay in financing and in obtaining structural steel, together with construction requirements for keeping tracks in service will prevent completion before the fall of 1952.

• **Edens Expressway**—By September of this year Chicago-Milwaukee traffic will be speeding over this 14.75-mi expressway, from Bryn Mawr Ave on the north side of Chicago to Clavey Road just north of the Cook County line. The four-lane divided highway, costing $18,000,000 plus $5,000,000 for right of way has three complete interchanges and five partial interchanges. All but one of the 25 structures in the project have been completed. At the end of last year $9,000,000 of construction had been finished; $6,000,000 was under contract; with $3,000,000 of paving to be awarded this spring.

• **East St. Louis bridge**—This $6,900,000 four-lane bridge across the Mississippi at St. Louis, was opened to traffic late in 1950. With an overall length of 1.5 mi, the project includes a cantilever bridge 1,903 ft long. Its main span is 964 ft—the longest such span on the Mississippi.

• **Missouri expressways**—Kansas City's 1.1-mi, $4,900,000 **Southwest Trafficway** was completed last year and is carrying 30,000 vehicles per day on its six traffic lanes. No construction is programmed by the Missouri State Highway Department this year for the 6-lane **Sixth Street Trafficway** in Kansas City, but plans are being prepared and the right-of-way, expected to cost $4,000,000, will be purchased this year. Designs for the 6-lane, 1.5-mi **St. Louis Freeway** from 12th and Gravois to 3rd and Walnut, are nearing completion. Two thirds of the right-of-way has been purchased for $2,100,000, but a state law prohibiting the eviction of families, which expires this June, will delay the starting of most of the construction.

• **Oklahoma Turnpike**—Bonds to the amount of $31,000,000 have been sold by the Oklahoma Turnpike Authority to finance its projected toll road from Oklahoma City to Tulsa and one contract for grading 4.5 miles between Sapulpa and Tulsa is under way. Letting of the remaining contracts is to start soon. Purchase of right-of-way yet to be acquired was begun on Jan. 1.

• **Texas expressways**—Last year the

(*Continued on p.* 251)

# FOSTER'S PILING RENTAL SERVICE

## Starts Job Months In Advance Of *Contractor's Plans

*A joint venture of the Western Foundation Corporation and Spencer, White & Prentis, Inc. and executed under the general direction of the Stone & Webster Engineering Corporation.

"This is the first time a circular steel sheet piling cofferdam, supported by a reinforced concrete wale, has been used in this country . . . and FOSTER PILING RENTAL SERVICE enabled this job to begin months in advance.

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Foster shipped 500 tons of Interlocking Steel Sheet Piling for this Cofferdam, used in the construction of water intake for a power plant of the Union Electric Light & Power Company, Venice, Illinois.

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Foster's Piling Rental Service gives you a "Head-Start" that means extra economy and extra profit by shipping immediately the exact length and exact section of piling the job demands. No deposit is required, and Foster's rental rate gives you a low fixed expense as an added competitive advantage when bidding on jobs.

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# Don't be Misled by Theoretical Capacities

**The HighLift Boom Means:**

- No crane or hoist
- No lost time or spillage transferring material
- No ramps or false work
- Reduces buggies required
- Reduces buggy time
- Saves labor

**Save money with the direct pour.**

IT is cubic yards in the form that count — not batches per hour. On your general construction and building jobs the Multi-Foote 27-E handles upwards to 50 cu. yds. an hour to the forms. The big 55 cu. ft. bucket and smooth operating controls at the bucket make it easy to divide or distribute the load as you want it with plenty of mix when and where you want it. On your floor jobs and housing jobs bucket clearance with level boom means time saved in placing concrete.

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Full size *open-end* skip takes batch trucks. Crawler traction will take your MultiFoote where wheels mire down or turn the machine in its own length without backing and filling.

— and, if the 27-E won't do the job there is the MultiFoote 34-E DuoMix for greater output. Get *all* the details before you buy a high capacity paving mixer.

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*Subsidiary of Blaw-Knox Co.*
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A BLAW-KNOX PRODUCT
FROM FORMS TO PAVER TO FINISHER ... ALL YOUR PAVING EQUIPMENT
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## MULTIFOOTE HIGH LIFT BOOM

TRADE MARK

**FOR EVERY PLACE CONCRETE MUST BE POURED**

Texas State Highway Department awarded $12,400,000 of expressway construction in its five major cities and completed 9.2 mi at a cost of $8,700,000. Contracts to be awarded this year include: **Ft. Worth,** 4.5 mi at $3,600,000; **Dallas,** 2.6 mi at $3,300,000; **Austin,** 2.1 mi at $260,000; **San Antonio,** 0.6 mi at $1,600,000; and **Houston,** 0.4 mi at $1,000,000. This will bring the state's total investment up to $39,200,000, for 31.7 mi of completed expressways (Houston, 10.4 mi; Ft. Worth, 7.3 mi; Dallas, 6.3 mi; San Antonio, 5.5 mi; and Austin, 2.2 mi). As an example of the need for these facilities, Houston's expressway is carrying an average of 60,000 vehicles per day.

• **Omaha, Neb.**–A $2,100,000 contract was awarded last January for the construction of a high-level toll highway bridge over the Missouri River in North Omaha. It will have one 26-ft roadway, and two 18-in. safety curbs. Overall length of the project is 29,850 ft. The main river structure will be 1,912 ft long, containing three cantilever-type truss spans, four steel girder spans and six steel beam spans. The 530-ft west approach will contain toll-collection facilities. The east approach, 27,400 ft long, will cross a creek and one double-track railroad. Completion of the project is scheduled for late next year.

• **Denver Valley Highway**–The Colorado State Highway Department has completed 2.0 miles of its 10.2-mi Valley Highway in Denver, at a cost of $5,200,000. An additional 1.8 mi are under construction, while this year's construction program of $950,000–mostly on structures–will depend on the availability of steel. Right-of-way purchased to date totals $2,000,000, with an additional $2,250,000 worth pledged under a city, state and federal agreement.

• **California freeway**–Freeway construction in California continues as swiftly as available funds permit with 6.9 mi open to traffic on three major freeways in 1950, at a cost of $10,835,000 (exclusive of right-of-way). Contracts in effect but not complete as of Jan. 1, 1951 follow (figures in parentheses show funds available for additional construction up to June 30, 1952): **Hollywood Parkway** $5,200,000 ($8,981,000); **Santa Ana Parkway** $3,914,000 ($4,948,000); **Eastshore Freeway** $6,025,000 ($5,777,000); **Bayshore Freeway** $3,449,000 ($13,062,000); **Ramona Parkway** $1,512,000 ($9,102,000); and **Harbor Parkway** $2,579,000 ($2,483,000). These figures are for major freeways

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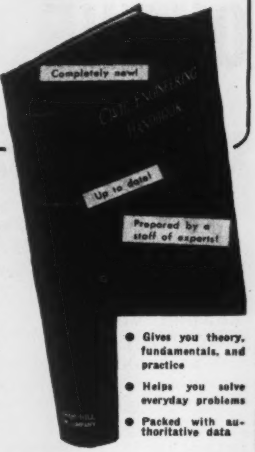

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Routes of the major freeways are: Hollywood and Santa Ana Parkways extend from North Hollywood through the heart of downtown Los Angeles to Santa Ana; Harbor Parkway extends from downtown Los Angeles to the San Pedro harbor area; Ramona Parkway extends east from Los Angeles to Pomona; the Eastshore Freeway extends from the Carquinez Bridge along the east side of San Francisco Bay south to San Jose (passing the east end of the San Francisco-Oakland Bay Bridge); and the Bayshore Freeway extends from the west end of the Bay Bridge along the west side of the Bay and runs south to San Jose.

• **California bridges**—During 1950 bridge contracts in the amount of $24,000,000 were underway in California. During the year $26,000,000 was allocated to bridge construction on the State Highway System and approximately $3,000,000 was allocated for bridge projects under control of the State on other roads. Bridges worth $14,000,000 were completed in 1950. The majority of the structures completed during the year were on new freeways. Several major bridge projects have been designed and will be advertised in the near future. Among these are a bascule bridge across San Leandro Bay (Bay Farm Island) in Alameda, a concrete arch bridge over the Arroyo Seco in Pasadena, and a portion of the Division Street Interchange known as the 9th and 10th Street Connection from the Bayshore Freeway near the approach to the San Francisco-Oakland Bay Bridge.

• **Broadway tunnel**—This twin-bore, two-lane-each-way, vehicular tunnel under one of San Francisco's famous hills was 17% complete at the year's end. Construction contract on the 1616-ft long tunnel (total project length is 2,800 ft) is $5,253,552. Scheduled for 1952 completion, the tunnel will speed traffic flow from downtown San Francisco to the Golden Gate Bridge.

• **Alaskan Way Viaduct**—The year saw the substantial completion of the first $1,194,000 unit of the $8-million Alaskan Way viaduct, designed to bypass Seattle's main business district. As 1951 began, work was started on the second $3,691,400 section of the double-deck structure. Scheduled for award this summer is the third and final unit of the viaduct and also a $2,295,100 vehicular subway, Seattle's first, to connect the north end of the viaduct with the main highway out of the city. Completion of the tunnel and viaduct is scheduled for Aug., 1952.

• **Harbor Drive Expressway**—The last of the several contracts involved in the building of this expressway in Portland, Ore., was awarded in August, 1950, with a cost estimated at $725,000. The over-all length of the expressway is 3.36 mi. Completion is scheduled for Dec. 31, 1951. Completed cost will run to $7,825,000 inclusive of $2,125,000 for rights of way.

• **T. H. Banfield Expressway**—This expressway, formerly referred to as the Sullivan Gulch Expressway, will have a length of 14.0 mi and extends from the heart of the City of Portland east to Troutdale, being a part of U.S. Highway Route No. 30. Purchase of rights of way is in progress with $1,700,000 having already been expended for that purpose. The first construction contract is scheduled for letting in April or May. Total cost is estimated at $12,300,000, inclusive of $4,800,000 for rights of way. For 5.8 mi, this project parallels the Union Pacific Railroad in a natural depression, locally known as Sullivan Gulch, providing full separation between the expressway and all of the intersecting streets.

• **Columbia River Highway**—Reconstruction of a 41-mi section of the Columbia River Highway between Cascade Locks and The Dalles were commenced by the award, in August, of a contract for grading between Viento Park and Wygant. Additional contracts totalling $3,300,000 are programmed for letting early in 1951. The completed cost is expected to run to $12,000,000. Roadbed construction will involve much heavy rock excavation as well as considerable embankment construction by hydraulic dredge methods.

• **Tacoma Narrows Bridge**—The $18,000,000 Tacoma Narrows Bridge, third longest suspension span in the world and the first designed to resist aerodynamic forces, was opened to traffic in the fall of 1950 after the completion of construction which began in 1948. It replaces an earlier bridge which collapsed in a high wind Nov. 7, 1940, after having been in use only a few months. The 8-ft solid stiffening girder of the old bridge has been replaced with a 33-ft deep stiffening truss. The new roadway is two lanes wider and has open steel grating 18-in. wide separating each of the lanes. Width between cables of the new bridge is 60 ft, as compared to

(*Continued on page* 255)

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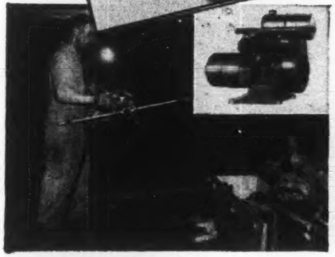

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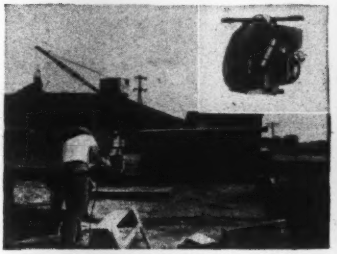

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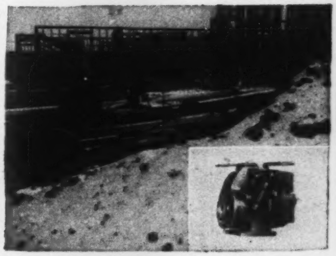

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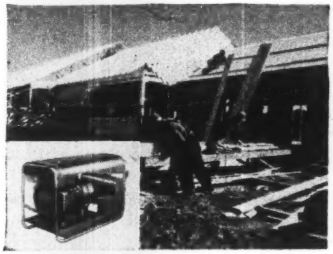

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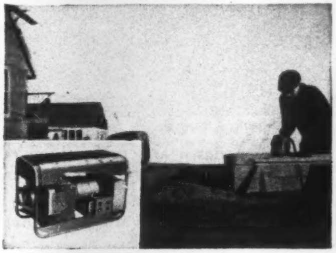

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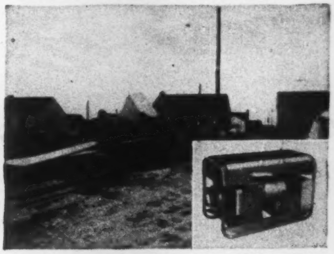

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• **Blue Creek Bay Bridge**—This structure crossing an arm of Coeur d'Alene Lake in Idaho was 85% complete when construction was shut down for the winter. Spectacular phase of the construction involved piers of 18-in. dia steel cylinders penetrating mud for as much as 200 ft with no lateral support other than the mud. Total cost of this Bureau of Public Roads forest highway project will be $1,400,000 including approaches.

• **Hilo, T. H.**—Progress continues on the 40-mi, 24-ft-wide, $12,000,000 Hamakua coast industrial highway, which will serve some of the most important Hawaiian sugar-growing areas. The route is through rugged terrain with 40 major and several minor bridges required to account for rainfall up to 270 in. a year. Contracts for 6 mi of road costing $2,200,000 are now under construction, and 7 more mi costing $2,920,000 is to be contracted this year. 15.3 mi costing $5,588,000 is already complete. Final completion is scheduled for 1952.

• **Honolulu, T. H.**—At a cost of $2,300,000, one mile of Honolulu's waterfront arterial highway is complete. A $600,000 contract for demolishing and altering existing piers to make way for the six- and eight-lane asphaltic concrete thoroughfare has been let. Contracts for another 1.8 mi including a bridge across part of the harbor will be let in 1951, with the cost of these estimated at $5,350,000. Work also may start in 1951 on a parallel second arterial running across the city about a mile back from the sea.

• **Honolulu, T. H.**—Litigation over rights-of-way has delayed progress on a proposed $5,600,000 tunnel and highway project to improve the road from Honolulu to its built-up suburbs in windward Oahu across the famed Nuuanu Pali. However, a 1.9-mi approach road section costing $1,200,000 now is under construction.

• **Burlington cutoff**—To shorten the Chicago Burlington and Quincy RR's Kansas City Chicago line by 22 mi, this new 71-mi location extends northeastward from a point 20 mi northeast of Kansas City. To cost $16,000,000 it has been under construction for about a year, will be put in service by the end of 1951. Work includes heavy cuts, and fills built to

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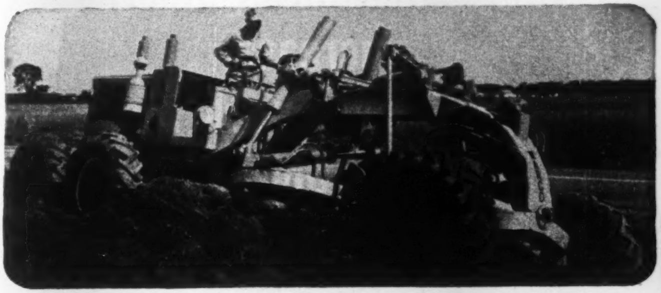

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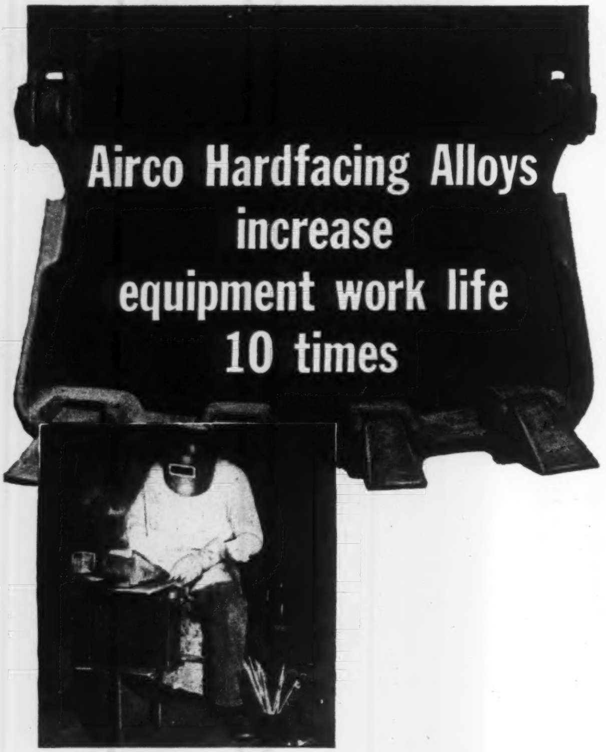

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• **Iron ore railroad**—Swinging back to the far northeast, ENGINEERING NEWS-RECORD picks up major rail construction works. In Canada the Quebec, North Shore and Labrador Railway Co. last fall began assembling equipment at Seven Islands, Que. for work on a 358-mi single track line to iron ore deposits in Labrador's back country. Seven Islands is 300 mi down the St. Lawrence's left bank from Quebec City. Equipment now is being distributed along the location. Maximum grade against loaded ore trains will be 0.2%, compensated for curvature. Annual ore tonnage is expected to reach 10,000,000 in 1956, the second year after construction is complete. Cost is estimated at $70,000,000.

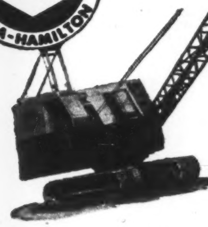
• **Toronto subway**—Canada's first subway took another big step in 1950 with the award in May of the two-mile remainder of a three-mile underground section, and the award in December of a half-mile open-cut section, including shops and yards. The first contract amounted to $7,000,000, the second $3,000,000, bringing total awards to $20,000,000. The mile begun in 1949 was 55% complete Jan 1. The second contract was 10% complete. These jobs will be finished next spring, and the first open-cut section will be ready a year later. About a mile of open-cut work remains to be let.

• **Boston subways**—Extension of rapid transit 2.1 mi from present underground station in East Boston had progressed 75% Jan. 1, with completion expected in Nov. 1951. The two-track line continues 2,000 ft underground, then emerges to grade, the first above-ground station being at Logan Airport, near the East Boston Expressway airport connection.

• **New York subways**—The Hillside Ave. IND division extension, adding a half mile of 4-track subway in the city's Borough of Queens, was opened to traffic in December. Cost was $7,600,000. In the same cost range is a project begun in October—an underground connection between IND and BMT divisions at Queens Plaza, to allow IND trains to operate through BMT's uptown East River tunnel. This job is due for completion in late 1953.

• **Philadelphia subway**—when present plans and work are fulfilled, Philadelphia will have a subway westward from Broad and Market Streets as far as 46th St. Now under construction or complete are three contracts west of the

(Continued on page 259)



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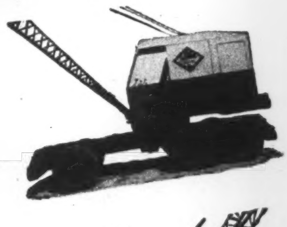

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- Types 34 and 604 available with wheel mounting.
- One engine powers all operations, including travel
- One operator controls all operations from cab
- Rotating assemblies have same basic features as corresponding crawler machines

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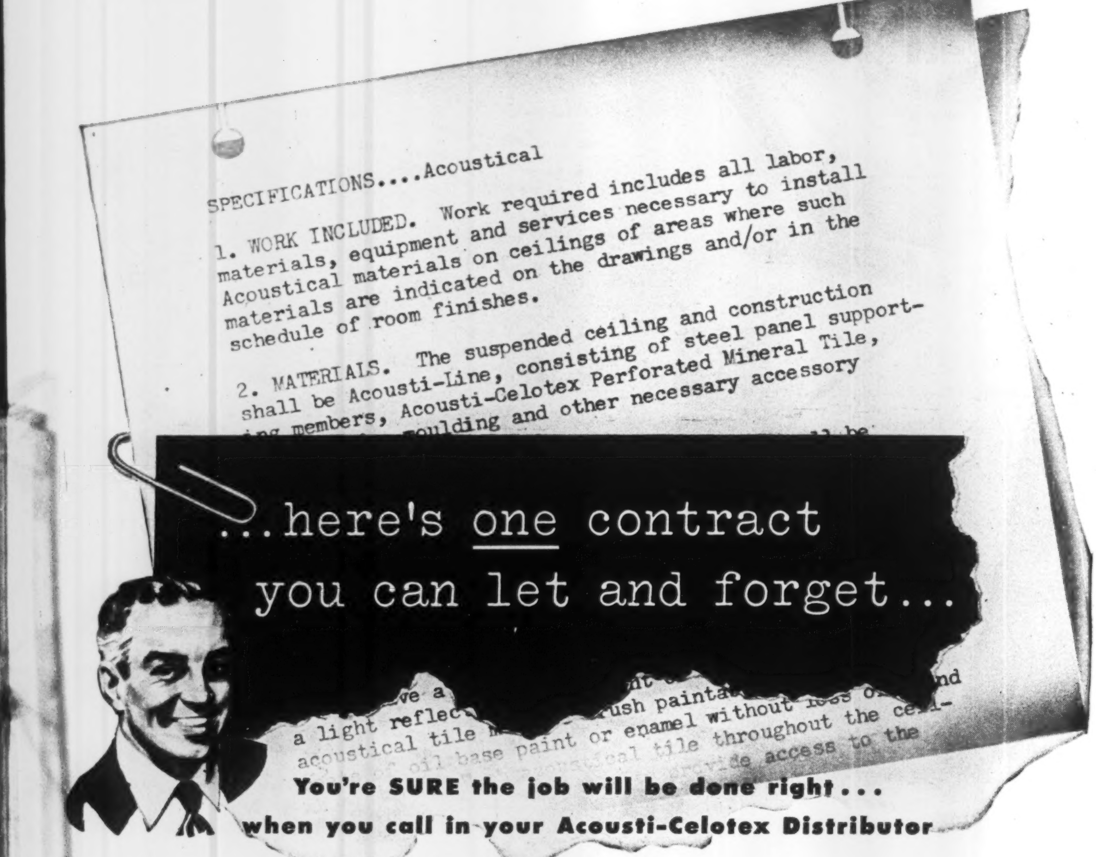

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Schuylkill River: 32nd to 36th St., $7,600,000, complete in Nov. 1950; 36th to 42nd St., $6,000,000, complete in Dec. 1950; 42nd to 46th, $3,000,000 begun Oct. 1950, 10% complete Jan. 1, 1951, to be finished Dec. 1951. (The under-river link, 24th to 32nd St., $5,000,000, was built in 1933). Plans to link present subway at 22nd St. to tunnel at 24th St. and to bring subway up to existing elevated line at 46th St. are complete and construction should begin this year.

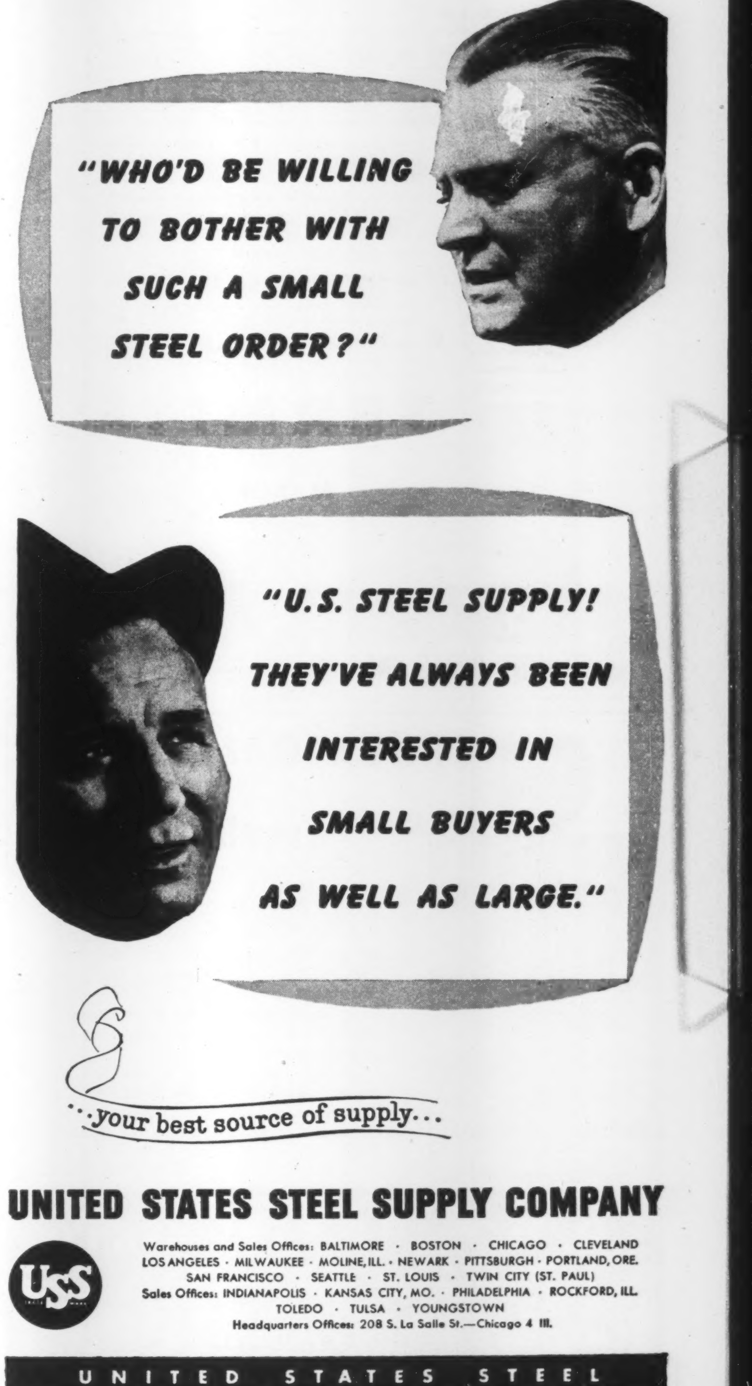
• **Norfolk and Western line change**—Construction of a 5.2-mi change in line and grade on the double-track main line of the Norfolk and Western Ry. through rugged country between Cooper and Lick Branch, W. Va. was complete at the end of 1950. A 7,050 ft double-track tunnel to replace a single track bore was opened to traffic in June. Project cost: $11,500,000.

• **Boston airport**—At Logan International Airport, East Boston, Mass., the $3,800,000 first-stage apron building was put into use during 1950. Extension of one north-south runway to 10,000 ft. also was complete and paving began on a parallel 8000-ft. runway. These runway jobs total $2,300,000.

• **Baltimore airport**—Costing $15,000,000, Friendship Airport was opened last spring. Nine miles south of Baltimore, it covers 3,400 acres, has a main runway 9,450 ft. long and two runways in the 6,000-ft. range. Embodying advanced features like mechanical baggage handling, the main building provides facilities adequate for 200 landings a day.

• **Philadelphia airport**—Work amounting to $17,000,000 is under way at Philadelphia International Airport, in the city's southwestern part. Paving and draining a main-runway extension to 7,400 ft. will be complete in May; ramps and taxiway work will be finished in late summer. This work will cost $2,000,000. A $9,000,000 terminal building was 20% complete Jan. 1, will be finished in late 1952. An additional $6,000,000 worth of work around the terminal is under way.

• **New York Pier**—A concrete and steel structure founded on floating caissons is under construction to replace Pier 57, North River, which was destroyed by fire in 1947. Two contracts totaling over $6,000,000 have been let: for cutting off old wood piles and stabilizing the site with sand drains, $459,000; for construction the con-



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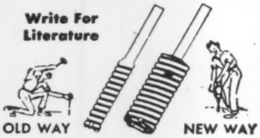

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on
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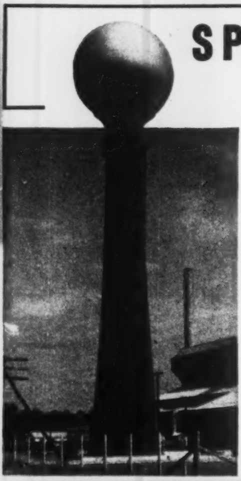

• The COLE Spherical Tank on Tubular Tower is a pioneer in its field. We designed and erected first tank of this character built. It provides an attractive and serviceable unit—economical to maintain, efficient in service and pleasing in appearance.

Write for special booklet on these modern welded Spherical Tanks which provide gravity water pressure, and for copy of latest Cole catalog—"Tank Talk."

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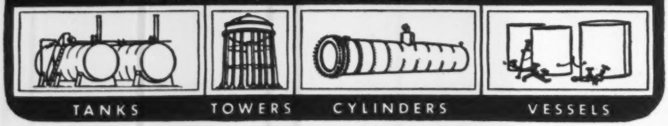

crete substructure, $5,685,500. Steel superstructure is estimated to cost another $4,500,000 when the contract is let. Completion is scheduled for late 1952.

• **Port of Baltimore**—Principal activity in this port is an ore dock in Curtis Bay. Under construction by the Baltimore and Ohio R. R., the new facility will cost $5,000,000 when completed.

• **Long Beach, Cal.**—Port work under way at this West-Coast point includes a new deep-water pier and several steel sheetpile bulkheads. The latter will cost $5,700,000, according to engineers' estimates.

• **Transcontinental gas line** — Rio Grande Valley natural gas began to move to New York Jan. 1, 1951, with substantial completion of the 1,840-mi $240,000,000 Transcontinental Gas Pipe Line Corp. line. This work had begun in 1949. Major features included an unusually difficult crossing of the Hudson River to bring the fuel to New York.

• **California pipeline**—Northern California's gas supply was increased during 1950 when the Pacific Gas & Electric Co. completed a 34-in., 500-mi. pipeline from the southern California border. The $63,300,000 project, started in the summer of 1949, is now adding 200,000,000 cu ft daily to the company's system. This will be doubled next year with the addition of the planned pumping and compressor stations.

• **Pipelines**—Among important crude and products pipelines, two were completed in 1950: A $90,000,000 1,150-mi line from Edmonton, Alta., to Superior, Wis., and a $15,000,000 236-mi line from Portland, Me., to Montreal, P. Q. Under way at year-end was a 707-mi line from Baton Rouge, La., to Charlotte, N. C. Under way in the gas pipeline field were: A 1,331-mi line from Corpus Christi, Tex., to Joliet, Ill.; a 723-mi line from Lisbon, La. to Middleton, Ohio; a 470-mi line from the great San Juan Basin in New Mexico, to Franconia, Ariz.

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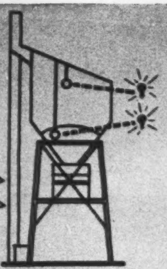

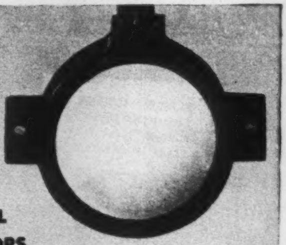

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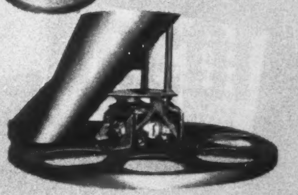

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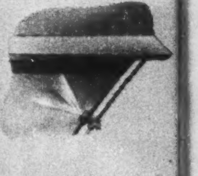
Saves costly truck waiting time. Truck loads hopper and is off and away. Buggies or barrows unload Hopper in meantime. Easily transported.



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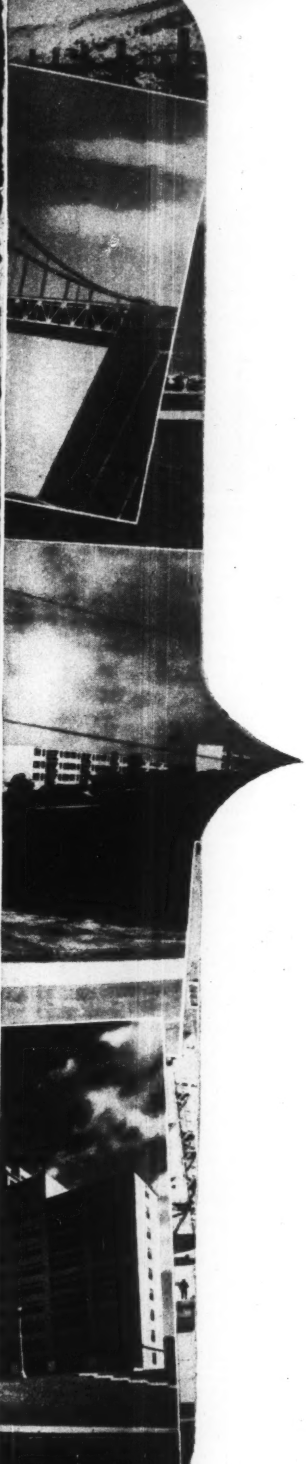
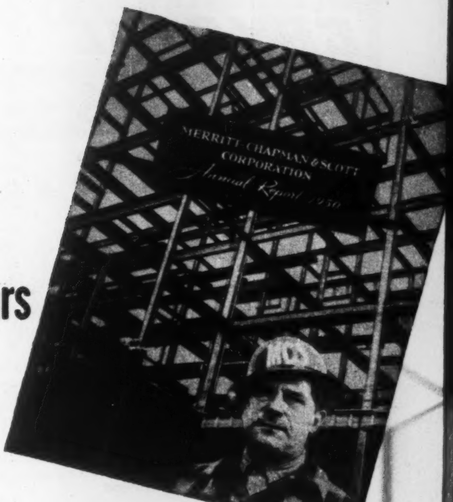
475-BED VETERANS
ADMINISTRATION
HOSPITAL
WILKES BARRE, PENNA.
ARCHITECTS:
*KELLY & GRUZEN*
ENGINEERS:
*U. S. CORPS OF*
*ENGINEERS*

**Cross-Section of Some Projects Completed in 1950**



# TODAY...

as for the past 91 years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# Water supply and sanitation

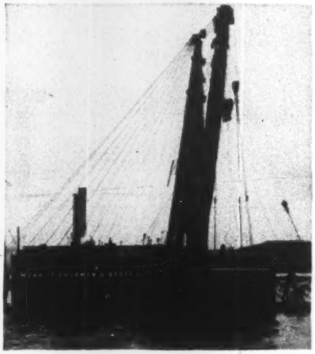
• **Akron, Ohio**—The city's $3,600,000 program for rehabilitating its 34-year old water treatment and pumping station will be finished this year. Major improvements in the distribution system are: 4-mi of 20-in. and 24-in. feeder mains, and a 2.0-mg standpipe—both finished last year; a 750,000-gal reinforced concrete underground reservoir now 75% finished; and 2-mi of feeder mains and a second 2.0-mg standpipe to be completed this year.

• **Allentown, Pa.**—A filtration plant extension and high service pumping station project began last July at a cost of $2,750,000. The work is now 20% completed; all structures should be finished in '51 and by summer of '52 the 20-mgd addition should be in service. Nearly all contracts have been let. Raw water for the new extension will still come from Lehigh Creek—still supplemented by Schantz Spring. It will be put through eight new 2.5-mgd filter units.

• **Baltimore, Md.**—First and second sections of $19,000,000 Patapsco Water Tunnel are finished, with the $2,850,000 lining job just winding up. Connections to the Montebello Filter Plant have been made, and a 48-in. cast iron main under the harbor is just about finished. This spring, bids will be asked on Liberty Dam for the Patapsco River. This $4,500,000 project would provide an additional safe yield of 94 mgd from behind a 160-ft high dam. Road relocations upstream from the dam will mean constructing 8 new bridges varying from 200 to 2,300 ft in length at a probable cost of $4,000,000.

• **Boston, Mass.**—Only $200,000 remained to be spent in 1951 on the $9,500,000 City Tunnel section of Hultman Aqueduct. The section was substantially completed last year. It is a 5½-mi stretch with a 10-ft finished diameter, drilled in rock and concrete-lined from four shafts. Average depth below surface is 400 ft.

Blue Hills Reservoir is 85% completed, and the 6-mi pipeline to Quincy is 40% finished. Pipe is 48-in. bituminous-lined steel; cost, $1,500,000. Total cost of the project is $2,250,000, and about $900,000 is still to be spent to complete the work in 1951. Boston suburbs to benefit are Milton, Quincy, Braintree and Weymouth.


**EMERGENCY INTAKE—This 145-ton intake crib is now at the bottom of the Hudson, ready for emergency pumping of up to 100 mgd for New York City.**

Extension of the Metropolitan District Commission's City Tunnel work from Chestnut Hill to Medford is planned to start in 1951—unless war prevents it. This would be a $15,000,000 concrete-lined rock tunnel 7 mi long; $3,375,000 would be spent this year.

• **Bristol, Va.-Tenn.**—Financing construction with a sewer charge, based on water consumption, this city started a $3,800,000 sewage treatment plant and sewer extension program last year. Work is getting under way on the plant 2 mi south of town where Beaver and Steeles creeks meet. Laying of 65 mi of sewers is 18% finished. Completion of the entire project is scheduled for April, 1952.

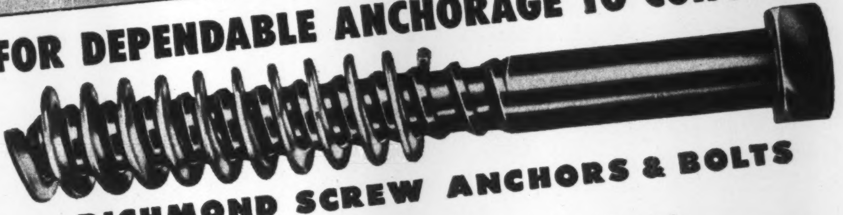
• **Chester, Pa.**—Abandoning its polluted and salty Delaware River source, Chester has turned to the upland watershed of Octorara Creek from which it will take 20 mgd for now, 30 mgd in the future. The dam and a filtration plant have been completed; some 25 of 39 mi of transmission main from the filtration plant to the existing Chester-Harrison Hill Reservoir is installed; Oxford Summit and Village Green reservoirs are under construction; and the new water supply is scheduled to be available by fall, this year. In anticipation of increased demand, new feeder mains are being installed. Already over $11,000,000 has been committed on the project; total cost is expected to reach $14,818,000.

• **Chicago**—Army approval in January

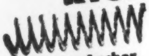
*(Continued on page 267)*

ENGINEERED TYING DEVICES, ANCHORAGES and ACCESSORIES for CONCRETE CONSTRUCTION

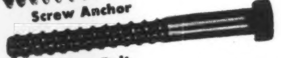
# FOR DEPENDABLE ANCHORAGE TO CONCRETE



## RICHMOND SCREW ANCHORS & BOLTS



**Screw Anchor**



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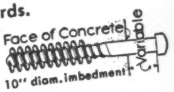
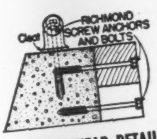
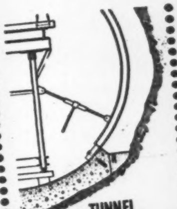
**Screw Anchors are made for bolt diameters up to 1½ Inch**

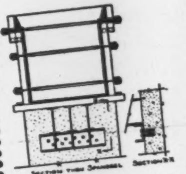

Face of Concrete
Variable
10'' diam. imbedment


Cleat
RICHMOND SCREW ANCHORS AND BOLTS

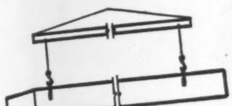
PIER BULKHEAD DETAIL



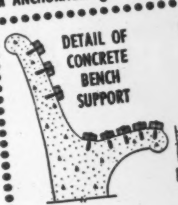
TUNNEL FORM ANCHORAGE


SECTION THRU SPANDREL
SECTION B-B

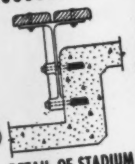
SPANDREL BEAM SUPPORT



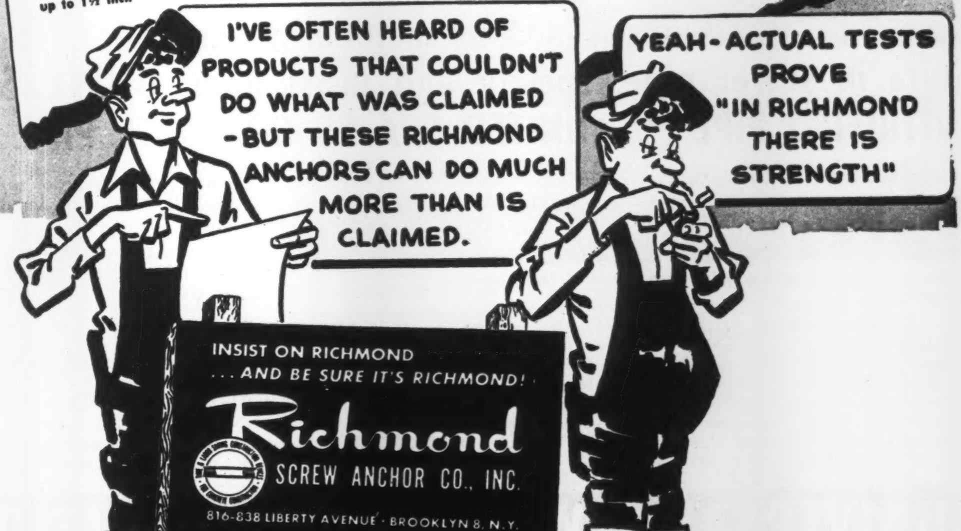
CONCRETE PILE LIFTING DETAIL



DETAIL OF CONCRETE BENCH SUPPORT



DETAIL OF STADIUM SEAT BRACKET ANCHORAGE


I'VE OFTEN HEARD OF PRODUCTS THAT COULDN'T DO WHAT WAS CLAIMED -BUT THESE RICHMOND ANCHORS CAN DO MUCH MORE THAN IS CLAIMED.
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**UNIVERSAL SEWER PIPE CORPORATION**
**UNITED STATES CONCRETE PIPE COMPANY**
*GENERAL OFFICES • 1500 Union Commerce Building • CLEVELAND 14, OHIO*

(*Continued from page 264*)

of the site for the city's proposed Central District Filtration Plant paved the way for this 950-mgd plant, to be located 500 ft out in Lake Michigan, just north of Navy Pier. The $85,000,000 project, expected to take 6 years for completion, will serve over 2,000,000 North and West Side residents of Chicago, and several suburban communities. Initial construction, for which plans are ready, include a $4,000,000 sheet-pile cellular and rubble masonry cofferdam enclosing the 61-acre site, and 6 mi of 16-ft and 20-ft horseshoe tunnel leading to the Chicago Avenue and Wilson Avenue pumping stations. Raw water for the new plant will be secured from the present William E. Dever intake and from a supplemental intake at the plant.

A major improvement completed last year at the city's 320-mgd South District Filtration Plant was the installation of a $65,000 dehydrating system for its six large pipe galleries.

• **Cleveland, Ohio**–By the end of this year Cleveland's eastsiders will be getting Lake Erie water from 100-mgd Nottingham filtration plant. The 3½ mi of 10-ft dia intake, costing $6,100,000, was virtually completed at the end of last year. The $12,200,000 filter plant and pumping station were 72% finished, and $6,900,000 of other facilities in the program were 50% completed.

• **Dallas, Tex.**–Over 100 mi of water distribution and feeder mains were installed last year at a cost of $2,750,000, while $2,850,000 of water line extensions were under contract at the beginning of this year. Other work now under construction includes a 96-mgd, $6,200,000 water purification and pumping plant; 9.3 of 54-in and 66-in supply mains, at $2,200,000; a 2-mg elevated tank and a 10-mg concrete underground storage tank. This year's program includes a $200,000 booster station and $1,200,000 worth of additions to the distribution system.

• **Denver, Colo.**–Contracts completed last year in the city's five-year waterworks expansion program totaled $1,260,000–mostly for waterline extensions. Contracts totaling $5,660,000 were awarded last year, however, for 30-in. to 66-in. conduit lines, two diversion conduits in the mountain area (water is delivered into Denver by gravity), storage facilities, and improvements to booster stations and filtration plants. This year's construc-

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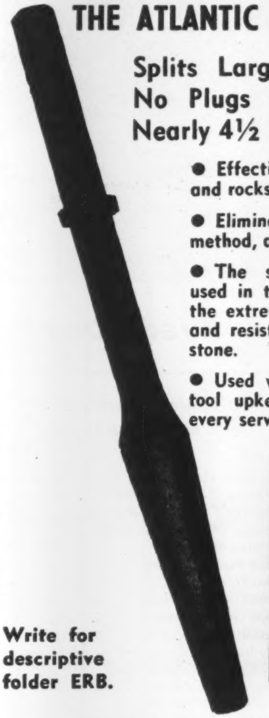
Use with your standard power pavement equipment . . . .

THE ATLANTIC PNEUMATIC ROCK BREAKER

Splits Large Rocks and Boulders quickly
No Plugs and Feathers — No Explosives
Nearly 4½ times faster

- Effective quick action in removing stones, boulders and rocks from excavations and ditches.
- Eliminates the slow and costly plug and feather method, and the risky and troublesome use of explosives.
- The specially heat-treated Atlantic Tool Steel used in the Atlantic Pneumatic Rock Breaker gives it the extreme toughness to withstand the severest usage and resist breakage regardless of the hardness of the stone.
- Used with standard power pavement breakers. No tool upkeep. Tougher than any stone. A size for every service.



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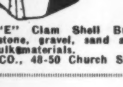
*Specialists in Tool Steels for chisels, drills, blacksmith tools and Alloy Steels for axles, bolts, pins, pistons and shafts.*

*Non-tempering tool steels for greater safety and speed.*

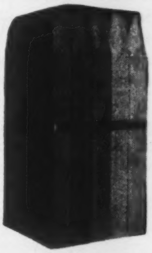
ATLANTIC STEEL CORP. 1775 BROADWAY, N. Y. 19

Hayward Buckets



Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.
THE HAYWARD CO., 48-50 Church St., N. Y.

High Grade Hardwood
SURVEYOR STAKES
Stained Yellow Bound with Steel Strapping



| | Per 100 | In 1000 Lots Per 100 |
|---|---|---|
| 2x2—12" | $ 7.15 | $ 6.50 |
| —15" | 8.80 | 8.00 |
| —18" | 9.60 | 8.70 |
| —24" | 11.50 | 10.45 |
| —36" | 16.50 | 15.05 |
| GRADE STAKES | | |
| 1x2—12" | 5.60 | 5.10 |
| —15" | 5.75 | 5.20 |
| —18" | 5.80 | 5.25 |
| —24" | 6.90 | 6.26 |
| —36" | 9.70 | 8.80 |

Prices net F.O.B. Cumberland, Md.

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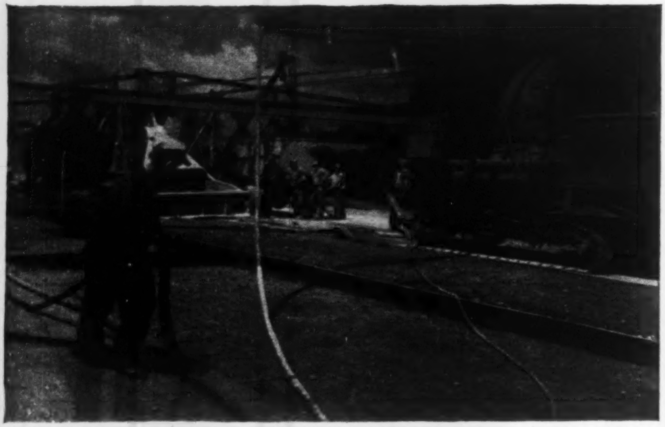

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**WATER HOSE**

Take Maltese Cross® Water Hose, for example, for high-pressure, heavy-duty use. Top quality from inner tube to cover, Maltese Cross stays on the job because it's *designed right* and *built right.*

**CEMENT PLACEMENT HOSE**

Or look at Monarch® Cement Placement Hose. To withstand the cutting action of sand and cement, you'll find an inner tube of *pure gum rubber a full quarter-inch thick!* And we make the carcass so strong no outer cover is needed. That makes Monarch a *one-man hose!*

**AIR DRILL HOSE**

For hard rock drilling, Maltese Cross Air Drill Hose is "made to order" because it has the great strength and high resistance to hot oil and lubricants so vital in mining and heavy construction service.

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Portable Skid Tank Gasoline Dispensing Hose
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Sand Suction Hose
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* * *

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HEWITT-ROBINS
CONSTRUCTION HOSE

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tion program of $14,300,000 includes a $12,000,000 dam and reservoir to impound 42,000 acre-ft of water.

• **Detroit, Mich.**—The Department of Water Supply awarded contracts for $6,800,000 of construction last year, and completed $5,300,000 worth. Construction to be awarded this year will cost $5,500,000, in addition to $1,500,000 of small distribution mains, meters and services.

Work completed last year included: $1,900,000 of new services, meters and distribution mains up to 16-in. dia.; 27,000 ft of 16-in. to 66-in. transmission mains; and a 10-ft dia raw water tunnel to the Northeast Pumping Station. The first 5,800 ft of this tunnel is finished and the remaining 21,000-ft section is 31% completed.

Contracts awarded last year included the construction of 34,400 ft of 16-in. to 54-in. transmission mains, and a $5,600,000 contract for the 21,000 ft of 10-ft dia tunnel. The bulk of this year's program included substructures and equipment for the Northeast station, and 17,000 ft of 54-in. transmission mains.

• **Hetch Hetchy Aqueduct**—Last June, San Francisco's water supply was given a 30-mgd boost when a second pipeline was completed across the San Joaquin Valley. The entire $12,000,000 aqueduct project will be complete late this year and will bring the capacity of the city's supply up to 140 mgd.

San Francisco's Cherry Creek Dam and power house will be in the initial phases of construction this year. Estimated to cost between $25,000,000 and $30,000,000, first work will be done on the dam itself, with the federal government paying $9,000,000 of its $13,000,000 cost. Bids will be called on an access road as soon as engineering is completed—probably this spring. Installed capacity of the power plant will be 80,000 kw.

• **Los Angeles, Calif.**—The $10,000,000 Baldwin Hills Reservoir was completed and put in use early this year. Holding 293 mg, it will supply the southwestern portion of the city.

• **Marin County, Calif.**—The 5-yr, $4,000,000 expansion program for the Marin Municipal Water District is in its second year. Some 5 mi of 16 to 24-in. water transmission lines were completed in 1950 and almost 6 mi will be installed in 1951. Also to be undertaken this year is a 1,200-ft, 8-ft

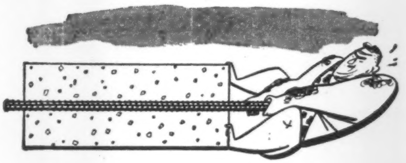
(*Continued on page 270*)

Advantages offered by
Inland HI•BOND since 1943
now officially recognized by
American Concrete Institute

At the annual convention of the American Concrete Institute in 1949, Committee 208 on Bond Stress proposed changes in design stresses for concrete reinforcing bars. These proposals were made after Bureau of Standards tests proved that certain "improved" reinforcing bars could live up to higher standards.

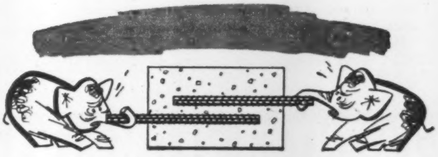
At the 1950 convention, the ACI Building Codes Committee adopted the proposals of Committee 208. And in February 1951, the Institute officially accepted the new building code change.

It is interesting to note that Inland HI-BOND has, for eight years, offered all advantages of higher bonding properties now officially recognized by ACI.



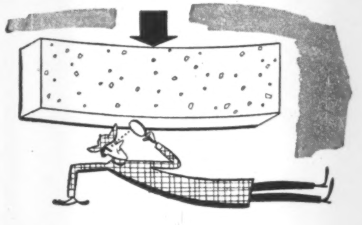
**1 Increased bond stresses and greater resistance to slip**

See reports on National Bureau of Standards research by Arthur Clark . . . ACI Proceedings, Vol. 43, p. 381; Vol. 44, p. 437; Vol. 46, p. 161; by C. C. Fishburn . . . ACI Proceedings, Vol. 44, p. 289.



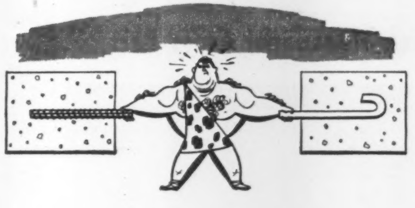
**2 Increased efficiency at splices**

See reports on National Bureau of Standards research by Ralph W. Kulge and E. C. Tuma . . . ACI Proceedings, Vol. 42, p. 13.



**3 Reduced width of tensile cracks**

See reports on National Bureau of Standards research by David Watstein and Norman Seese, Jr. . . . ACI Proceedings, Vol. 41, p. 293.



**4 Hook anchorages unnecessary in most applications**

See reports on National Bureau of Standards research by C. C. Fishburn . . . ACI Proceedings, Vol. 44, p. 289; by F. E. Richart . . . ACI Proceedings, Vol. 45, pp. 97 and 237.

See new ACI Building Code

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CEMENT GUN CO. RESTORES BRIDGE

Photo above shows the disintegrated condition of an abutment on a reinforced concrete bridge in a large Western Pennsylvania city. Repair work on this structure necessitated an almost complete rebuilding of the abutment. To accomplish this, the end span was jacked up and new expansion plates were placed at the bridge seats. In addition to repair of abutments—beams, girders, and arch ribs were reintegrated with "GUNITE" wherever disintegration had taken place.

This is just one of many typical "GUNITE" repair jobs which have been done by our contract department for Railroads and State Highway Departments throughout the country. For information on "your job" and description of many other "GUNITE" jobs performed by us send details and request catalog A2400—on your letterhead, please.

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GENERAL OFFICES—ALLENTOWN, PENNA. U.S.A.

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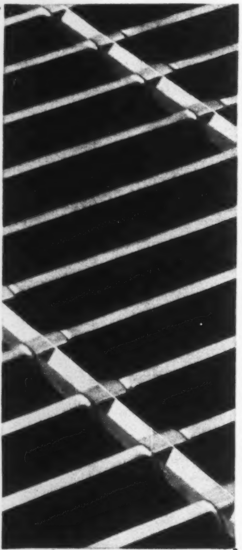

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This particular design of welded grating is made with the main bars on 1-3/16" centers or .915 centers and the cross bars on 4" centers in panels 24" or 36" wide, and lengths to 36' 0".

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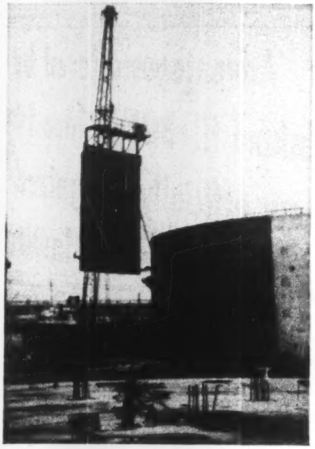

FORM STRIPPING is on a large scale at New York City's 160-mgd Owl's Head sewage works.

dia., outlet tunnel for Bon Tempe Dam. Construction of a filter plant and new storage dam originally scheduled for '51 has been deferred.

• **Mobile, Ala.**—All contracts but one have been awarded for the city's $7,000,000 water-supply improvement program, scheduled for completion by next Jan. 1. Chief feature of the program is a 77-ft high, one-mile long earth dam to impound water of Big Creek. The completed project which also includes a pumping plant with 7 deep-well pumps, 9 mi of 60-in., reinforced concrete pressure transmission line, a 50-mg reservoir at the city's filtration plant, and 7 mi of 48-in reinforced concrete gravity line, will furnish 100 mgd of water to the city and two large industries. A roadway will be constructed across the earth dam following completion of the dam.

• **New Orleans**—Section I (13,200 lf) of the Sewerage and Water Board's 6.1-mi, 50-in. dia steel pipe cross-town water main, to serve the north and east parts of the city, was completed last year for $790,000; and Section II (8,200 lf) was placed under contract for $580,000. This year's program calls for awarding installation contracts for an additional 11,000 lf (Section III) at an estimated cost of $770,000. Additional improvements to the water treatment and distribution facilities now under contract or to be awarded soon total $490,000.

• **New York City**—The Board of Water Supply expects to let $9,000,000 worth of work in 1951. This will be spent relocating highways, clear-

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With a Homelite Dual Purpose Generator you can operate the newest type concrete vibrators . . . the high cycle vibrators that enable one man to do the work of three.

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With this type of generator . . . the only one of its kind . . . you can mix the old with the new. You can use it to operate your old standard universal tools or floodlights. And, at the same time, you can use it to operate the newer, lighter weight, more productive and easier-to-handle high cycle tools.

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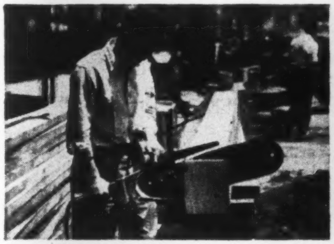
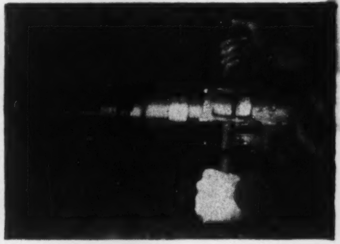


With a Homelite Dual Purpose Generator you can operate Homelite High Cycle Electric Chain Saws . . . the lightweight one man chain saws that cut cutting costs down to a new amazing low.



The high cycle tools . . . impact wrenches, drills, grinders, etc . . . that you can operate with a Homelite Dual Purpose Generator are lighter-weight, faster-working, easier to handle and far more trouble-free.

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# How to control 10 jobs at once

## AND MAKE MONEY!

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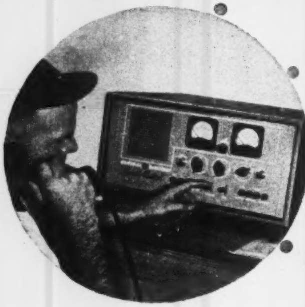

**"Radio control saves us money** every day we work," says Lee Blades of the Blades Construction Company, Hornell, New York. "We do road oiling, contractual work on bridges and highways, and operate a bituminous plant. Our jobs fan out in a 100-mile radius from headquarters, with crews and equipment spread over six counties."

**Cut communication delay** and you cut costs—in materials, in production, in manpower. In wide area operations, you need tight control. Why not talk it over with our G-E engineers—at no obligation? To get action, mail the coupon today.

**CIVIL DEFENSE**—For plant protection and community service, tie into your city's 2-way radio emergency network at little cost. Ask the General Electric Electronics Department office near you for full details.

*You can put your confidence in*—

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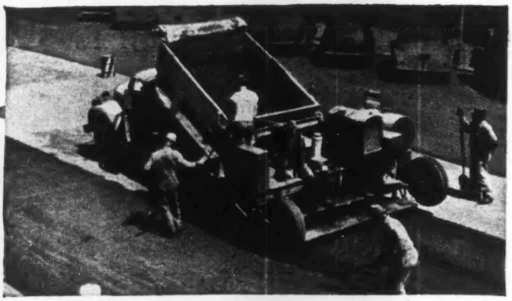
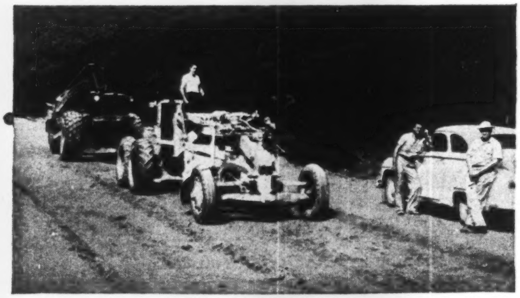


**Radio control saves $600-$700 an hour.** When paver breaks down, radio message shuts off bituminous plant miles away, saves fuel oil, heating time, labor and mileage.

**Job superintendent in the field** calls headquarters 20 miles away. Via radio he can talk to foremen on other jobs in construction company work area.



**Road grader, down for repairs,** gets fast help from radio call to dispatcher describing trouble and requesting parts.

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ing reservoir areas and buying equipment for operation of the East Delaware and Neversink tunnels.

In 1950, the board practically completed equipping the Delaware Aqueduct and pushed ahead on the two upstream delivery tunnels. East Delaware tunnel (11-ft 4-in. dia. x 25-mi length) was 15% finished at year's end and will cost $44,000,000; $15,700,000 Neversink tunnel (10-ft dia. x 5-mi. length) was 35% completed. The three 200-ft high earthfill dams in the first and second stages of the Delaware System development are: Merriman, 85% done, cost $26,000,000; Neversink, 75%, $32,000,000; Downsville, 45%, $30,000,000.

On the Hudson River near Chelsea, N. Y., the board has completed in 1950 a pumping plant at a cost of $2,684,000 to pump up to 100 mgd. from the river in case of extreme emergency.

• **Norfolk, Va.**—During 1950, contracts totaling $2,621,000 were completed for: laying 15 mi. of 48-in. concrete pressure pipe; crossing the Elizabeth River's Eastern Branch with 48-in. steel pipe on concrete pile trestles; crossing the Southern Branch with 48-in. cast iron flexible joint pipe. Under a $495,650 contract (excluding equipment), the purification plant at Moores Bridges is 50% finished. This includes new coagulation and sedimentation capacity for 24 mgd and rehabilitation of six filters having a 12 mgd capacity. This year, the city expects to lay 15 mi of 48-in. concrete pipe from Simonsdale to a raw water pumping plant at Lake Prince. Estimated cost: $2,000,000.

• **Philadelphia, Pa.**—Queen Lane pretreatment plant to cost $4,590,000 is 60% completed, and $1,650,000 will be spent on it this year. It is a 4-hr detention unit to pass 120 mgd. Water main laying projects to be undertaken this year will total some $2,000,000 worth.

• **San Diego, Calif.**—Completed in 1950 and dedicated early this year was the 66-mgd Alvardo filtration and softening plant. The plant is designed to make the hard Colorado River water that the city has been getting since 1948 more suitable for domestic use.

• **San Juan, P. R.**—The $2,000,000 Loiza Filtration Plant with 30-mgd initial capacity (60-mgd ultimate) was put in service last fall at Trujillo Alto,

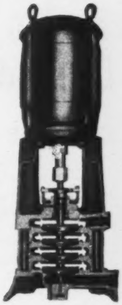
(*Continued on page 274*)

PUMP NOTES by DEMING

New "Multi-Stage" HIGH PRESSURE Centrifugal Pumps

(at left) Fig. 6606 Four Stage Unit

(at right) Sectional View of Four Stage Unit



● These new pumps are designed for a wide range of industrial applications where the liquids handled are non-corrosive to iron and bronze. Also efficient for boiler feed service where temperatures do not exceed 250°F.

Pumps are furnished in 2, 3, 4, or 5-stage construction. All have 1½" suction and 1" discharge openings.

Capacities range from 10 to 45 G. P. M. for corresponding heads up to 400 ft., and with 2, 3, and 5 H. P. motors operating at 3500 R. P. M. Vertical type motor has standard NEMA type "C" mounting flange.

Stainless steel pump shaft is coupled to motor shaft with compression sleeve type coupling.

Further details, dimensions, and performance ratings are available in BULLETIN NO. 6606.

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536 Broadway • Salem, Ohio

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*Construction News Division*
F. W. Dodge Corp., 119 W. 40 St., N.Y. 18

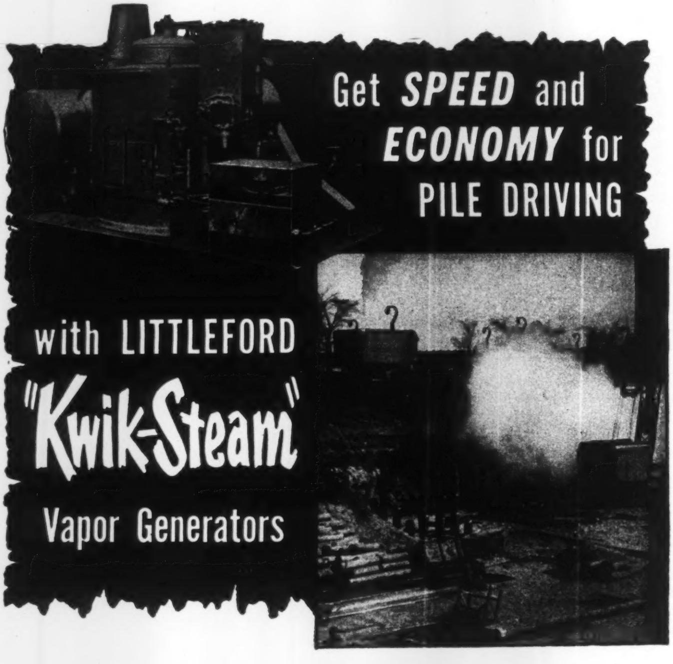
outside San Juan. It is fed through a 48-in. line by a temporary pumping plant at the site of the 50-ft high dam now under construction. The Loiza project is the largest in an islandwide program of water supply development for which $22,700,000 was made available in 1949.

• **Tulsa, Okla.**—Component parts of the city's three year $15,000,000 program for increasing its water supply to furnish 63 mgd are either nearing completion or under contract. Meanwhile plans are under way to increase treatment plant capacity from 40 to 60 mgd, at a cost of $8,000,000.

Contracts awarded last year included a new $2,400,000 dam to form Spavinaw Lake, and $700,000 Grand River crossing which comprises 25,500 ft of 72-in. and 84-in. concrete pipe and 1,450 ft of 108-in. dia tunnel.

Work completed last year, costing $6,100,000 included: a new chlorination plant, the West Tulsa Reservoir and a connecting 36-in. steel pipeline; a large amount of 66-in. and 72-in. concrete pipe construction. Only $190,000 worth of construction will be let this year.

(*Continued on page 277*)



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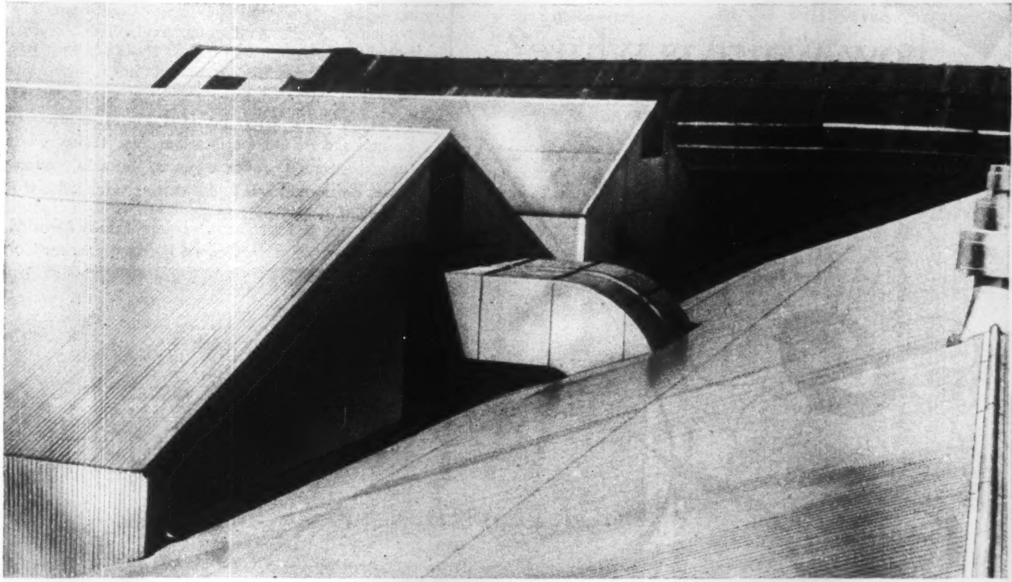
415 E. Pearl St., Cincinnati 2, Ohio

# For plant defense and defense plants...



## Strong... Rustproof... Corrosion-Resistant

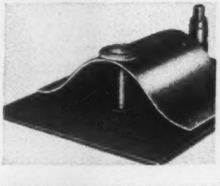
# Reynolds *Lifetime* Aluminum Industrial Corrugated

This picture shows Reynolds *Lifetime* Industrial Corrugated on brick kilns of Sayre & Fisher, Sayreville, N. J.—roofing just being started on building in background. It demonstrates "plant defense" against a special enemy...sulphurous oxide fumes. Sayre & Fisher had found no other material that stood up against these fumes.

Aluminum resists corrosion. Rustproof, it needs no painting...practically eliminates maintenance. Its relatively light weight needs less massive framing. And, in this extra-thick and deeply corrugated form, it is exceptionally strong. (.032" thick; corrugations ⅞" deep, 2⅔" crown to crown; supports 80 p.s.f. uniform load on 4-ft. purlin spacing.)

Aluminum also reflects radiant heat ...reducing inside summer temperatures and winter fuel bills. Where exposed on the inside, its brightness means more light for workers. Yet Reynolds *Lifetime* Aluminum is low in initial cost, easily installed over any type purlin. Reynolds supplies strap, purlin wire and complete accessories—*also Nelson "Rivweld" Studs.*

For technical assistance, call any of the Reynolds offices...in 32 principal cities. Literature on request from Reynolds Metals Company, Building Products Division, 2005 South Ninth Street, Louisville 1, Kentucky.



**NELSON "RIVWELD" STUDS cut application costs!**

Contractors report up to 50% savings! Applied from above —no inside work, no scaffolding. Cross-section shows flux-filled base, aluminum insert and aluminum washer placed before riveting.

REYNOLDS METALS

**Aluminum is required for planes and other military needs. Reynolds *Lifetime* Aluminum Industrial Corrugated is still produced, but the total supply is necessarily reduced. DO-rated orders receive priority handling.**

# REYNOLDS ALUMINUM

how white is white?

In William Shakespeare's words:

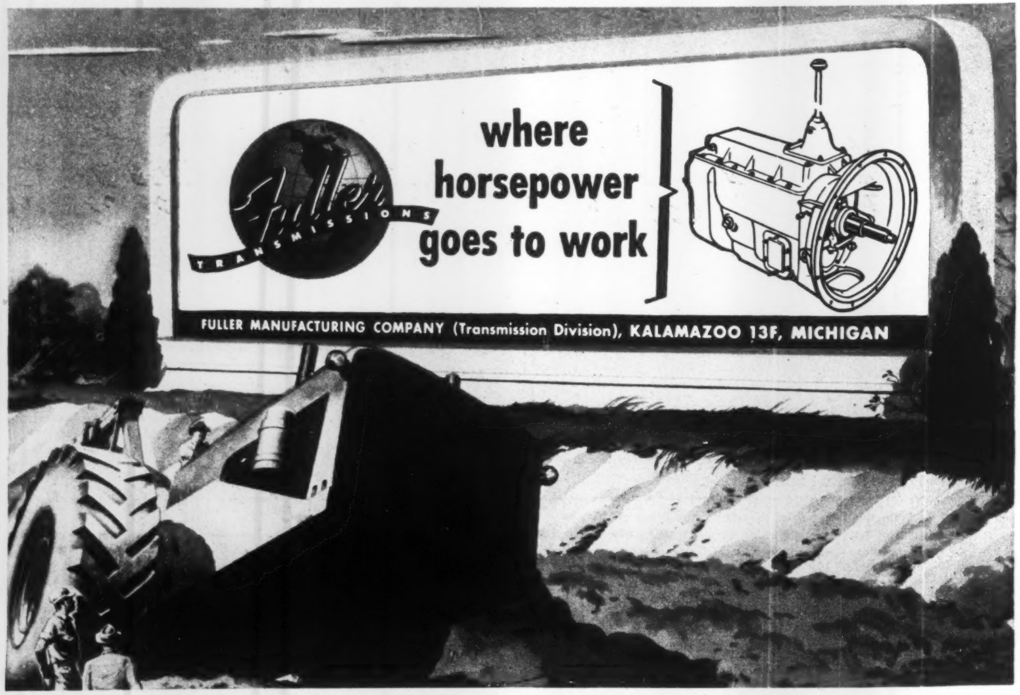
"*. . . . perfect white shows like an April daisy in the grass . . . .*"

Use Trinity white—the *whitest* white cement. Trinity white is a true portland cement. It meets all Federal and ASTM specifications. Use Trinity white for architectural concrete units, terrazzo, stucco, paint, ornamental work, tile setting, etc. Ask for it by its full name *Trinity* white.

Trinity Division,
General Portland Cement Co.,
111 W. Monroe St., Chicago;
Republic Bank Bldg., Dallas;
816 W. 5th St., Los Angeles.

Trinity White
PORTLAND CEMENT

TRINITY
WHITE
PORTLAND CEMENT


Fuller
TRANSMISSIONS
where horsepower goes to work
FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO 13F, MICHIGAN

# Sewage disposal

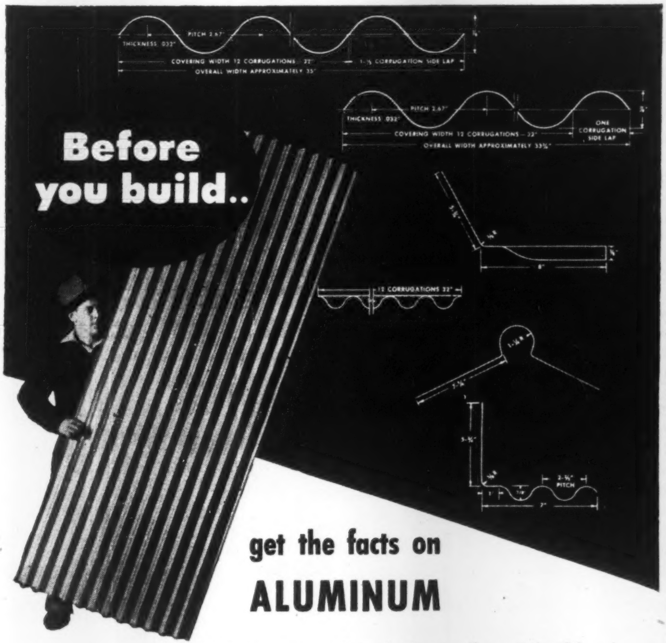
(*Continued from page 274*)

- **Akron, Ohio**—Sludge digestion tanks costing $1,690,000 have been completed in the city's $3,000,000 sewage-treatment improvement program. Construction of sludge incinerator furnaces costing $310,000, and an $890,000 sludge incinerator building, are now under contract.

- **Boston, Mass.**—Massachusetts' Metropolitan District Commission has 112-mgd Nut Island Treatment Plant 90% completed with full operation expected by fall. It's a $7,000,000 installation in Boston Harbor off Hough's Neck, Quincy.

Another $7,000,000 project of the commission is Northern Metropolitan Relief Tunnel, Chelsea to Deer Island (Boston Harbor), for which one shaft is under construction and 4 mi of deep rock tunnel is expected to be drilled in 1951. A 350-mgd treat-

(*Continued on page 278*)


PITCH 2.67"
THICKNESS .032"
COVERING WIDTH 12 CORRUGATIONS 32"
1-½ CORRUGATION SIDE LAP
OVERALL WIDTH APPROXIMATELY 35"
PITCH 2.67"
THICKNESS .032"
COVERING WIDTH 12 CORRUGATIONS — 32"
ONE CORRUGATION SIDE LAP
OVERALL WIDTH APPROXIMATELY 33¾"
12 CORRUGATIONS 32"
PITCH
Before you build..
get the facts on
ALUMINUM

All the facts you need to design and erect buildings using Alcoa Industrial Building Sheet have been assembled in this new book. Loading tables, erection details and accessory lists will show you how you can save construction time and maintenance costs.

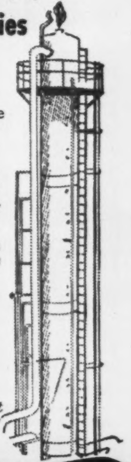
***Write for FREE BOOK***

BECAUSE REARMAMENT NEEDS COME FIRST, the supply of Alcoa Industrial Building Sheet is limited, but Alcoa is not limiting its design and engineering assistance. Ask your local Alcoa sales office for booklet AD-247 or write ALUMINUM COMPANY OF AMERICA, 806C Gulf Building, Pittsburgh 19, Pennsylvania.

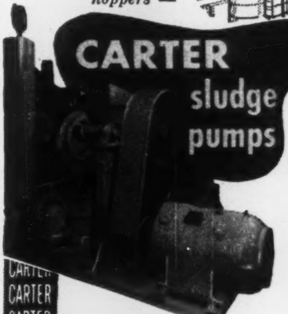
alcoa aluminum

ALCOA
INDUSTRIAL BUILDING SHEET

**Saving more $ $ $ in oil refineries**



**Refinery engineers report dependable performance—day after day—on important cost-cutting reclamation processes . . . *"transfer of bottom sediments in gravity-type oil-water separators to elevated decanting tanks"—"settled oil solids from sludge lagoons"—"cleaning out separator hoppers"—***


CARTER
sludge
pumps

**For processing of "problem" liquids, you will find the Carter sludge pump an actual economy! Specifically designed for handling of solid-laden, viscous and mildly corrosive liquids . . . practically eliminating emulsification, coagulation and agitation.**

**If you handle similar liquids—and have a problem . . . call us in. Our engineering staff will be glad to render a detailed, analytical report—at no obligation!** ***Our latest technical bulletin, No. 5002, is almost ready for press. Gives complete data on sludge pumps—and their application to your problems. May we reserve a copy for you? Write today—on your company letterhead.***

181 ATLANTIC ST.
R. B. CARTER SALES INC.
Hackensack, New Jersey

More work
Less cost
with foolproof
RUD-O-MATIC

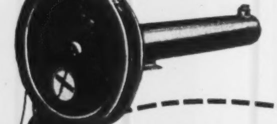
**TAGLINE CONTROL**

**HERE'S WHY:**

You get *more work* out of a bucket that holds steady and is back in position *quicker* for another bite. Rud-O-Matic Taglines have ample coil spring power to provide constant tension for steadying the largest clamshell buckets at any angle of the boom.

You get *lower costs* through faster operation coupled with Rud-O-Matic's trouble-free service. No pins, weights or tracks to get out of whack, only the simplest of working parts. Compact — and easy to install on any crane.

Rud-O-Matic Taglines are made in 8 models for all bucket sizes, and are supplied with cable and installation equipment. *Immediate delivery from your nearby equipment dealer — or send coupon below for details.*



I'd like more information on Rud-O-Matic Taglines. Send literature and complete details.

Name____________________

Company____________________

Address____________________

City__________Zone____State____

**McCAFFREY-RUDDOCK**
*Tagline* CORPORATION
2131 East 25th Street • Los Angeles 58, California

**39 MILES OF PIPE have to be laid to bring 20 mgd of upland water to Chester, Pa., mains.**

ment plant is planned for Deer Island.

Alewife Brook Sewerage Project, estimated to cost $2,500,000, has about all its 3½ in. of concrete pipe in place—2 mi of 66-in. and 1½ mi of 48 and 36-in. The project's pumping station is now under construction in Somerville.

• **Bremerton, Wash.**—Work was completed during the year on a sewage treatment system costing $1,198,286: two treatment plants, 10 lift stations and 33,800 ft of cement-asbestos pressure pipe—designed for 45,000 population.

• **Chicago, Ill.**—Nearly $12,000,000 worth of sewers will be placed under contract during 1951, but much of it will not be completed this year. Last year $3,800,000 worth of sewers were built under the city's auxiliary sewer program, financed from the Sewer Bond Fund; $1,300,000 for the main drain of the Congress Street Superhighway; and $1,500,000 of sewers by force account, or by contract financed by motor fuel tax. A total of 18 mi of sewers were completed last year, with the greater portion (dollarwise) being larger sizes, ranging up to 16.5 x 13.2 ft.

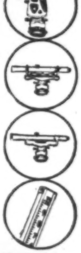
In the Chicago Sanitary District at the start of last year, there were $73,000,000 worth of sewerage construction projects in progress. During the year, $12,000,000 of work was started and $58,000,000 completed leaving $27,000,000 still in progress at the end of 1950. New work started last year included 75,000 ft of sewers and $5,000,000 for construction and equipment at treatment plants and pumping stations. Nine big pumps are being added at the Racine Ave. pumping

(*Continued on page 281*)

FIRST MAJOR IMPROVEMENTS IN
50 YEARS

Compare the Brunson to any instrument you know. Brunson alone offers you *all* these advancements . . . the first major surveying instrument improvements during the past 50 years.

- Ball-Bearing Spindle Base
- Ball-Bearing Telescope Axis
- Permanently Lubricated Sealed Dustproof Bearings
- Tangent Adjustment Wobble Pin.
- Flush-Filled Scale Graduations



*Precision surveying instruments*
*Transits, Levels, Rods, Tripods.*

LASTING **BRUNSON** ACCURACY

**Brunson Instrument Company, Inc.**
1405 Walnut St. Kansas City 6, Mo.

FLOORS CAN BE
SHOCK PROOF!
WITH OR WITHOUT FILL

***FOR LONG LASTING, HEAVY DUTY***
**DRIVEWAYS**
**TRUCKING AISLES**
**INDUSTRIAL FLOORS**
**AND THE LIKE**

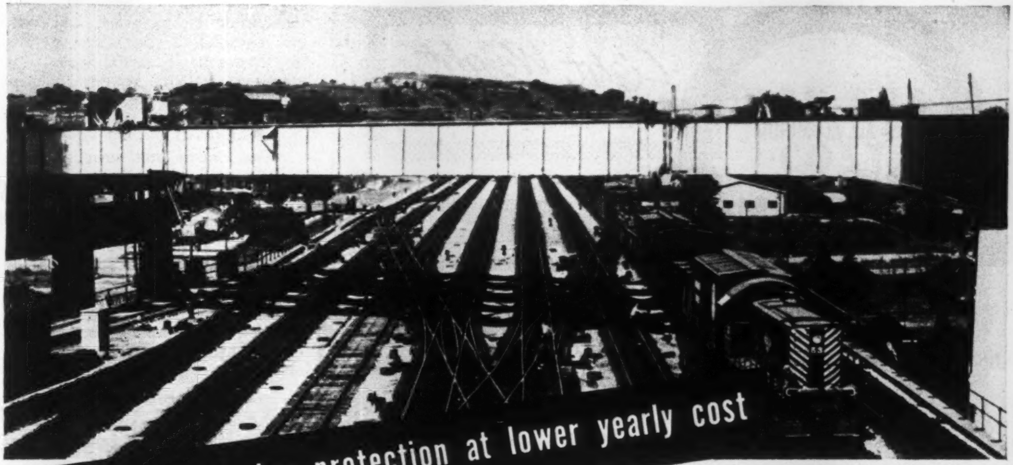
***Specify***

**"ARMOURING"**
TRADE MARK

***THE ORIGINAL STEEL MESH FLOOR SURFACE REINFORCEMENT***
***SHOCK-PROOF***
***WEAR-PROOF***
***CRACK-PROOF***

• ***Catalog on Request***

**IRVING SUBWAY GRATING CO., INC.**
5063 27th St., Long Island City 1, N. Y.
1863 Tenth St., Oakland 20, Calif.



## positive corrosion protection at lower yearly cost

Kansas City—girders of highway overpass metallized with .012" zinc to protect the steel from corrosive effects of locomotive flue gases.

## *with pure metallized zinc and aluminum*

The long-lasting, corrosion resistant qualities of pure metallized zinc and aluminum coatings are well known. Life expectancies for protective coatings of this nature, properly applied, range upwards of 20-30 years without further attention.

The Metco Systems, a new series of 18 basic engineering specifications developed by Metallizing Engineering Co., cover the protection of structures and equipment under a wide range of corrosion conditions, including immersion in salt or fresh water of various pH values; exposure to water ballast, condensate and some mild acid solutions, and to salt, humid, rural and industrial atmospheres ranging from light to heavy.

The Metco Systems are the result of over 19 years' experience with pure zinc and aluminum coatings on many different types of structures and equipment. They provide the answer to standardization of surface preparation, coating thickness for various service conditions and after-coatings to meet specific requirements.

The Systems also provide for meeting appearance requirements with specific organic coatings in a range of colors,all thoroughly tested for compatibility with the metallized zinc and aluminum.

**Reg. U.S. Pat. Off.—Property of Metallizing Engineering Co., Inc.*

### Metco System contractors

**The following organizations are set up to provide positive corrosion protection at lower annual cost in accordance with Metco* System specifications. For further information, or a copy of descriptive bulletin, contact the one nearest you.**

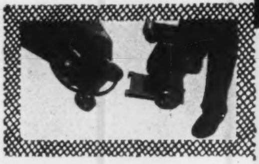
| | | | | |
|---|---|---|---|---|
| **Brooklyn, N. Y.**<br>**ARTHUR TICKLE ENGINEERING WORKS, INC.**<br>21 Delevan Street<br>Tel. Main 5-4200 | **New Orleans 13, Louisiana**<br>**GULF ENGINEERING CO., INC.**<br>1000 South Peters Street<br>Tel. Canal 4421 | **Newport Beach, California**<br>**CLARK METALLIZING, INC.**<br>506—30th Street<br>Tel. Harbor 2509 | **Barberton, Ohio**<br>**AKRON SAND BLAST CO.**<br>50 E. Springfield Rd.<br>Tel. Plaza 3412 | **Buffalo 1, N. Y.**<br>**METAL-CLADDING, INC.**<br>Lakeview & Porter Avenues<br>Tel. Elmwood 9536 |
| **Lincoln Pk. 25 (Detroit), Mich.**<br>**DIX ENGINEERING CO., INC.**<br>1417 Dix Road<br>Tel. Dunkirk 1-8822 | **Philadelphia 29, Pa.**<br>**METALWELD, INC.**<br>Fox & Hunting Park Ave.<br>Tel. Radcliff 5-3471 | **St. Louis, Missouri**<br>**NOOTER CORPORATION**<br>1420 South Second Street<br>Tel. Main 6000 | **New London, Conn.**<br>**THERMAFLO METAL PRODUCTS, INC.**<br>50 Dell Avenue<br>Tel. 2-4300 | **Houston, Texas**<br>**F. W. GARTNER CO.**<br>3805 Lamar Avenue<br>Tel. Atwood 5338 |

## *Light Weight*
**BUT HEAVY DUTY . . .**

- ALL-ALUMINUM
- WEIGHS ONLY 140 LBS.
- EASY ONE-MAN OPERATION
- HANDLES 1 TON PER MINUTE (1-1/2 H. P. ENGINE)

## FAIRFIELD
**ALL-ALUMINUM**
*Utility Conveyor*

● Gravel, crushed stone, coal, coke, cinders, salt, sawdust, sand, and what have you—these and many more are readily handled by this all-aluminum utility conveyor. This Fairfield conveyor is exceptionally easy to move and place—one man operates this rugged, versatile, conveyor—and it's a low cost item, too! Here's an economical investment that's built for lifetime service—it'll cut your materials handling costs and speed up your work schedules. Write today for complete description and specifications. Bulletin No. 1150.



Lifetime service means virtually no wearing of parts. Note easy maintenance feature—entire motor mount quickly removed.

**THE FAIRFIELD ENGINEERING COMPANY**

*354 CHICAGO AVENUE, MARION, OHIO*

CONVEYING SPECIALISTS FOR OVER A THIRD OF A CENTURY

---

# Concrete Pipe Machinery Co.

## MODEL "T" BELL-UP "McCRACKEN" MACHINE

**With 40 cu. ft. mixer and skip-loader to serve machine**

**FOR MAKING PLAIN AND REINFORCED CONCRETE PIPE**

**Range of Sizes—4" to 36"—80% of the Market**

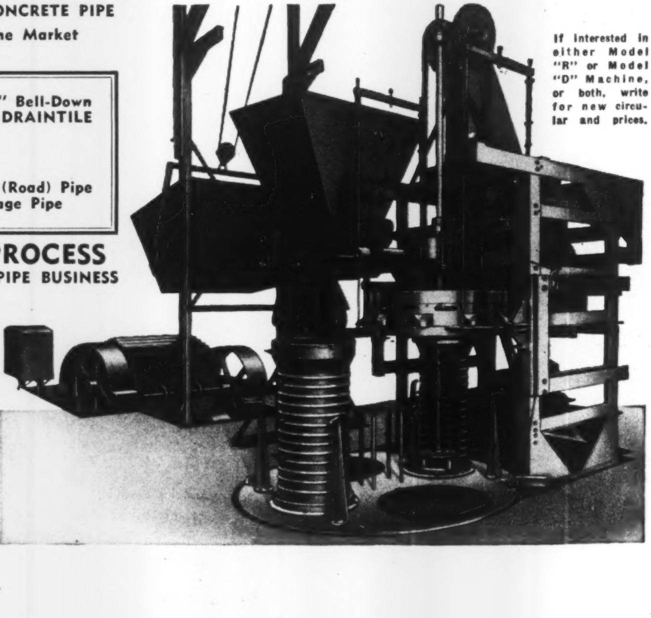
**WRITE FOR CATALOG**

McCRACKEN PIPE Corrugated

**ALSO MAKE MODEL "R"—Sizes 4" to 18" Bell-Down Machine. MODEL "D" Makes Butt-End DRAINTILE in 1 or 2 ft. lengths. Sizes 4" to 16".**

***USES FOR CONCRETE PIPE***

**Storm and Sanitary Sewers • Culvert (Road) Pipe**
**Irrigation (T&G) Pipe • Farm Drainage Pipe**



If interested in either Model "R" or Model "D" Machine, or both, write for new circular and prices.

## PACKER-ROLLER-HEAD PROCESS
**LEADS THE WAY TO MORE PROFITABLE PIPE BUSINESS**

**Eight-Hour Shifts Produce:**

**SEWER C-14**
**Plain B & S Pipe**
2400 feet — sizes 4" to 10"
1750 feet — sizes 12" to 18"
1200 feet — sizes 21" to 24"

**SEWER C-75 and CULVERT C-76**
**Reinforced T & G Pipe**
1600 feet — sizes 12" to 18"
1100 feet — sizes 21" to 24"
900 feet — sizes 30" to 36"

**Concrete Pipe Machinery Co.**
Cable Address: Macpipe

**EXPORT OFFICE**
P. O. Box 252
Pleasantville, N. Y.

**MAIN OFFICE**
Sioux City (17)
Iowa, U.S.A.

(*Continued from page 278*)

station to pump excess stormwater from the south side of Chicago into the Chicago River. Total capacity of the plant will be 5,050 cfs against a 20-ft head. New construction this year will run from $10,000,000 to $18,000,000, depending on available finances.

• **Detroit, Mich.**—Contracts will be awarded early this year for the construction of 78,900 ft of 10-ft dia sewer (Southfield Interceptor) on the southwest side of the city. This major addition to its sewage disposal system—the largest single improvement in the past 10 years—will enable Detroit to treat all of its own sewage; part of which formerly was treated in the Dearborn (Mich.) plant.

Other contracts to be awarded this year include 46,200 ft of large storm sewers up to 16-ft dia.; 73,000 ft of laterals; a $1,300,000 sewage pumping station; and $1,770,000 of improvements to pumping plants and diversion works. Last year seven contracts for 23.5 miles of sewers from 12-in. to 10.5-ft dia were awarded at a total cost of $9,800,000; and 15.5 miles of sewers were completed for $9,100,000.

(*Continued on page 282*)

# Tuffy

Magic Word for Cutting Wire Rope Troubles

Now — there's no tricky, complicated specifications involved in cutting wire rope costs to the ultimate low. Just say Tuffy to your distributor. Tuffy is the trade-marked name of a growing family of wire ropes, each especially designed and constructed to better serve a special purpose.

There is a Tuffy for machines employed on the tougher jobs such as earth moving scrapers and draglines, loggers, oil rigs and mechanical miners while Tuffy Slings team up with any load lifting machine. In each Tuffy are combined the flexibility, the strength and the toughness for the maximum service life as determined by never ending research and exhaustive field testing.

Just say or write the magic word "Tuffy" to your Union Wire Rope distributor—plus the length and diameter you need and the special purpose for which you require extra performance. See distributor listing in phone book, yellow section, or write us.

**UNION WIRE ROPE CORPORATION**
*Specialists in Wire Rope and Braided Wire Fabric.*
2228 Manchester Avenue Kansas City 3, Mo.

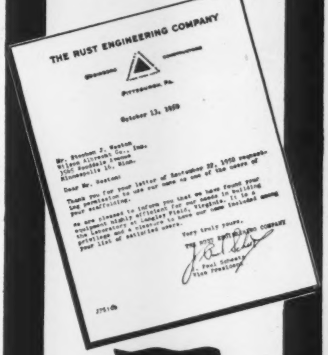
Please send information on ☐ Tuffy Slings
☐ Tuffy Draglines ☐ Tuffy Scraper Rope.

*Firm Name*..............................
*Address*..............................
*City*.................... *Zone*...... *State*..............

# YOU ARE COST MINDED!

These WACO sectional scaffolding users are cost-minded too: Peter Kiewit Sons' Co. of Omaha; Johnson, Drake & Piper Inc. of Minneapolis; Rust Engineering Company of Pittsburg.

Read the hearty recommendations of Rust Engineering Company.



THE RUST ENGINEERING COMPANY
Pittsburgh, Pa.

October 13, 1950

Mr. Stephen J. Weston
Wilson Albrecht Co., Inc.
3565 Wooddale Avenue
Minneapolis 16, Minn.

Dear Mr. Weston:

Thank you for your letter of September 22, 1950 requesting permission to use our name as one of the users of your scaffolding.

We are pleased to inform you that we have found your equipment highly efficient for our needs in building the Laboratory at Langley Field, Virginia. It is a privilege and a pleasure to have our name included among your list of satisfied users.

Very truly yours,
THE RUST ENGINEERING COMPANY
J. Paul [illegible]
J. Paul [illegible]
Vice President

JPS:db

WACO

Here's *one reason* why WACO sectional scaffolding warrants such users. It has *no loose parts*. For example a project which requires 250 end frames:

WACO requires—750 parts
Scaffold No. 1—2250 parts
Scaffold No. 2—1250 parts

. . . BUT—still the biggest reason for WACO's superiority is the WACO SPEED-LOCK METHOD of assembly.

WACO

Write today for the WACO prices and free catalog (form PS-20) showing load tests, speed of erection tests, unit parts & other important facts. Write today to push *down the costs and up the profits*.

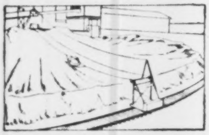
**WILSON-ALBRECHT CO., INC.**
3564 Wooddale Ave.
Minneapolis 16,
Minnesota

Whether it's digging, dredging, storing or reclaiming

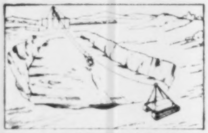
a SAUERMAN MACHINE CUTS COSTS TO ROCK BOTTOM

Picture shows a Sauerman drag scraper digging into a ridge of volcanic ash 250 ft. high and loading the ash into cars for use as track ballast.

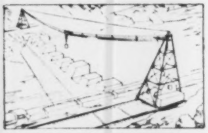
Sauerman Scraper Excavator



Sauerman Scraper Stockpiler



Sauermen Slackline Cableway



Sauerman Tautline Cableway

Engineers and managers in construction, mining, processing, public utility and other industries find that many problems of handling materials can be simplified by using one or the other of the various types of Sauerman Cableways and Power Drag Scrapers. These machines offer the particular advantage of being able to span a large area and move material at a rapid rate from point to point anywhere within that area.

The economic advantages of Sauerman Scraper and Cableway machines are as great as their operational advantages. The first cost of a Sauerman installation is reasonable, maintenance amounts to very little, and the simplicity of operation makes it possible to place the control of even the largest installation in the hands of one operator. Moreover, the equipment is very flexible and can be extended readily and otherwise adapted to changing conditions.

Every buyer of a Sauerman machine profits from the 41 years of experience of Sauerman engineers in designing and operating scraper and cableway equipment. We study his needs, then suggest the type and size of machine that will meet his requirements most economically, give him a lifetime of service.

The different Sauerman machines are described in detail in a series of catalogs, liberally illustrated with drawings and photographs. Tell us about your material handling problems and we will send you the catalogs that will be of most interest to you. Or use the coupon below.

No Obligation
Useful Catalogs with Engineering Data....
FREE!

SAUERMAN BROS., Inc.
532 S. Clinton St., Chicago 7, Illinois

Send free catalogs on following equipment:

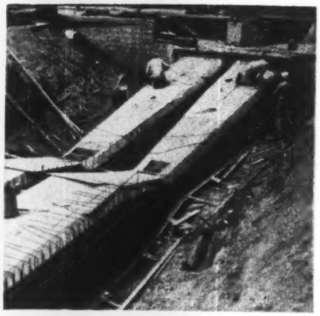
☐ Scraper Excavator ☐ Scraper Stockpiler
☐ Slackline Cableway ☐ Tautline Cableway

Name ..........

Company ..........

Address ..........

City .......... Zone ...... State ..........



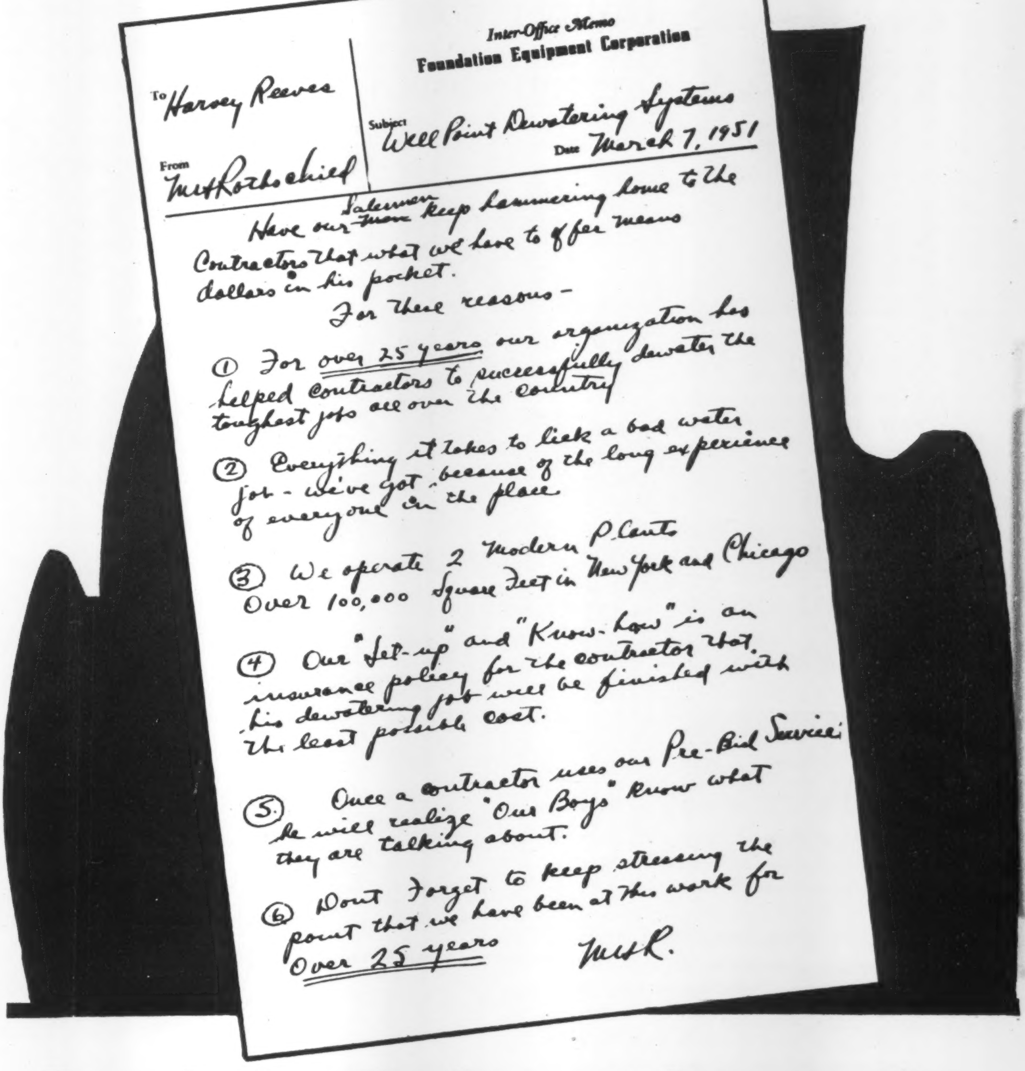
TWIN VENTURI TUBES entering new sewage treatment plant at Portland, Ore., are concrete instead of metal.

**• Honolulu, T. H.**—Since January, 1948, the Honolulu city-county government has completed 34 of 84 projects in a 10-year, $22,000,000 sewer program. In 1950, 14 sewer projects were completed at a cost of $1,570,000. Under construction now are 15 projects which will cost some $4,000,000. Seventeen additional projects, estimated at $4,000,000, are scheduled to start in 1951. Those now under construction include a 3,500-ft, 78-in. dia sewer outfall, a large sewage pumping station and many sewer improvement districts. A small pumping station and various relief sewers are scheduled in 1951.

**• Lake City, Wash.**—Work costing nearly $1,000,000 was carried out during the year in the Lake City Sewer District just north of Seattle, Wash., with contracts totaling an additional $1,300,000 scheduled for award this year. The entire $7,500,000 project is not scheduled for completion until 1954, with local improvement districts being formed as the sewer district builds up. The 1950 program included a primary settling tank, first unit of a 7-mgd activated sludge plant, and 9,000 ft of 27-to 36-in. trunks. This year's work will include ¼ mi of 7.5-ft tunnel and 2,400 ft of 72-in. outfall, as well as laterals.

**• Los Angeles, Calif.**—Initial portions of the 245-mgd, high-rate activated-sludge sewage-treatment plant at Hyperion were placed in operation in mid-1950. This permits treatment by primary sedimentation. Other portions are scheduled to be completed in 1951. In 1950, contracts totaling $8,947,400 were completed, including primary settling, digesters and general piping systems.

(*Continued on page 285*)



*Inter-Office Memo*
**Foundation Equipment Corporation**

To Harvey Reeves

From Mel Rothschild

Subject Well Point Dewatering Systems

Date March 7, 1951

Have our ~~men~~ Salesmen keep hammering home to the Contractors that what we have to offer means dollars in his pocket.

For these reasons -

① For over 25 years our organization has helped contractors to successfully dewater the toughest jobs all over the country

② Everything it takes to lick a bad water job - we've got, because of the long experience of everyone in the place

③ We operate 2 modern Plants
Over 100,000 Square Feet in New York and Chicago

④ Our "Set-up" and "Know-how" is an insurance policy for the contractor that his dewatering job will be finished with the least possible cost.

⑤ Once a contractor uses our Pre-Bid Service he will realize "Our Boys" know what they are talking about.

⑥ Dont Forget to keep stressing the point that we have been at this work for Over 25 years

Mel R.

# Foundation Equipment Corporation

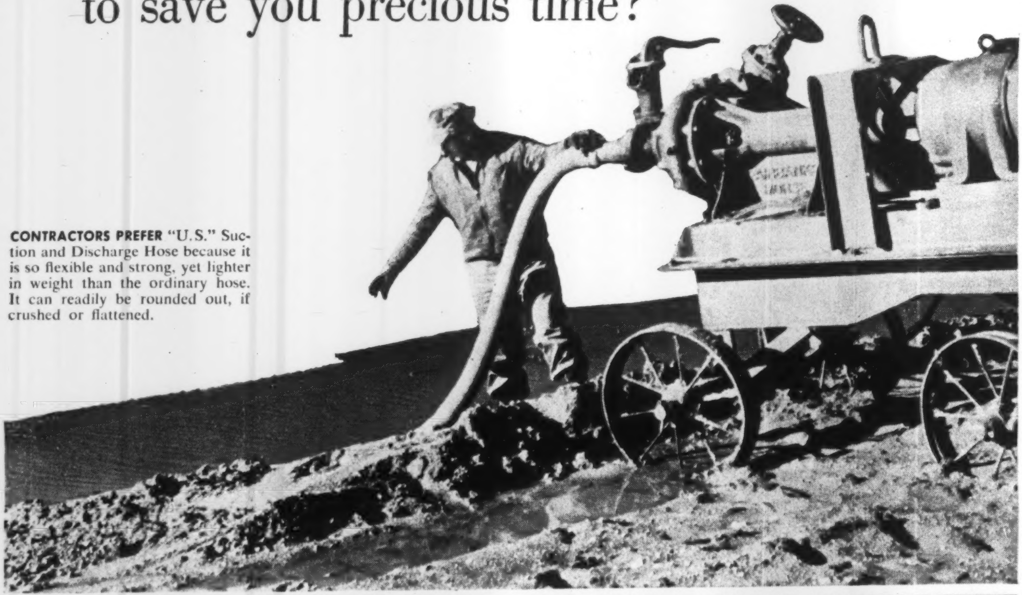
***RENTALS – SALES***

**NEW YORK**
38th Ave. & 10th St., Long Island City 1, N. Y.
RAvenswood 9-0590

**CHICAGO**
2608 West 111th St., Chicago, Illinois
Hilltop 5-1545 Harvey 2912

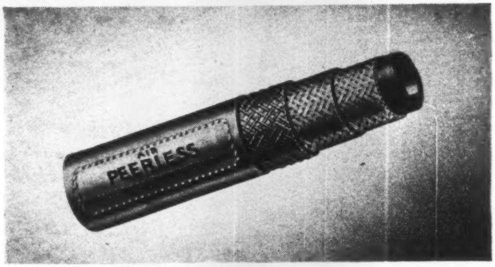
*Manufacturers of* **WELLPOINT DEWATERING SYSTEMS**

# What's U. S. Rubber doing to save you precious time?

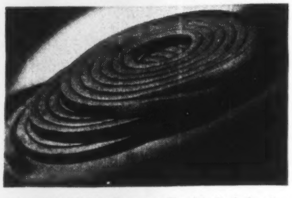


**CONTRACTORS PREFER** "U.S." Suction and Discharge Hose because it is so flexible and strong, yet lighter in weight than the ordinary hose. It can readily be rounded out, if crushed or flattened.

Contractors today, on big jobs or small, all over the nation depend on "U. S." products to speed up their work, and cut down operating costs. Each of these products is engineered for the particular job, depending on the service requirements. They are located in convenient branch stocks throughout the country for quick supply and delivery. Each product has been developed and perfected by "U.S." experts in construction work, men who have at their disposal the finest laboratories and immense research facilities. You may place the utmost confidence in "U. S." products for the construction industry.



**U. S. PEERLESS** Air Hose has oil-resistant synthetic rubber lining, and a tough, flexible, rubber compound cover with a resilient surface workman like to handle. Withstands both hot or cold oil in the air line.



**U. S. WIZARD** Square Braided Asbestos Packing is specially designed for reciprocating rods and plungers, valve stems, and centrifugal pumps handling steam, air, ammonia, oil, hot and cold water, chemicals and some acids. Provides the proper density and minimizes friction and wear of rods and shafts.

**PRODUCTS OF**

**U.S.RUBBER**

SERVING THROUGH SCIENCE

## UNITED STATES RUBBER COMPANY

**MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.**

(*Continued from page 282*)

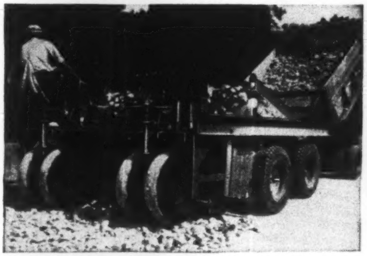
Other contracts showed the following completion percentages at year's end (figures in parentheses are contract amounts): influent connection 98% ($320,000); aeration system 97% ($2,917,300); final settling system 98% ($3,253,200); elutriation and sludge concentration 3% ($1,406,900); filter, drier and fertilizer storage 99.9% ($6,300,100); power and blower plant 99.9% ($3,617,000); power and light distribution 99% ($1,151,700); warehouse and shops 97% ($422,200); administration and laboratory 75% ($478,700); plant ground improvements 3% ($699,700); slope protection 87% ($78,200).

- **Milwaukee, Wis.**—Construction and equipment contracts awarded last year and early this year, totaling $2,350,000, will add 50-mgd of capacity to the city's activated sludge sewage disposal plant; increasing its total capacity to 200 mgd (dry weather flow) Completion is scheduled for the latter half of this year. In addition, two sludge-driers were installed last year for $900,000. Additional plant improvements costing $500,000 will be made this year if materials can be secured.

(*Continued on page 286*)

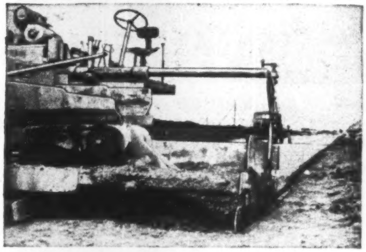
CUT WIDENING COSTS

APSCO WITH APSCO EQUIPMENT



TIMESAVING
APSCO BASE PAVER

A modern machine for handling base paving directly from truck. Accurate width and depth control. Much, much faster and more economical than the hand method. Easily spreads 160 tons per hour.



SURPRISINGLY
VERSATILE WIDENER

Handles most every aggregate including concrete — fills trenches 2' to 8' wide. No forms required! Capacity up to 150 tons per hour and on up to 200 tons per hour in building shoulders.

Small wonder that you see and hear about APSCO road widening equipment more than any other make! Pioneering in this field has produced exceptionally fine, efficient equipment. Includes road wideners, base pavers, widening chippers, trench rollers, tandem rollers. Send for specifications on any of these.

IT'S NEW! BITUMINOUS PAVER FINISHER (Details soon)

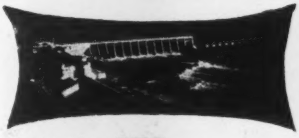
ALL PURPOSE SPREADER CO. Elyria, Ohio U.S.A.

it's DAREX AEA concrete!

TRUE ECONOMY

In the construction of the big McNary Dam on the Columbia River, DAREX A E A is now being used as the most economical air entraining agent to improve plasticity of the concrete as well as to reduce bleeding and segregation . . . another piece of evidence that no other air entraining agent for concrete is more efficient than DAREX A E A . . . that no other costs so little per cubic yard of quality concrete.

AT McNARY



DAREX AEA is the only catalyzed air entraining agent specifically formulated for making air entrained concrete.

DAREX AEA is in use everywhere on every type of concrete construction ... and in ready mix and concrete products plants using every known type of aggregate.

DAREX AEA is available in distributor warehouse stocks throughout North and South America and in most foreign countries.

Cement Products Division
Dewey and Almy
Chemical Company
Cambridge 40, Massachusetts
Chicago 38 Montreal 32
DAREX T.M. REG. U.S. PAT. OFF.

(*Continued from page 285*)

• **Nassau County, N. Y.**—District No. 2 Sewage Treatment Works on the south shore of Long Island at Bay Park will be completed in 1951. This $25,000,000 project is to treat 53 mgd—sewage of 53% of the county's population. Plant will have activated sludge, sludge digestion, vacuum filtration and sludge drying.

• **New Orleans**—Storm drainage totaling 3,700 ft of 8-ft to 16-ft concrete covered canals were completed last year for $790,000; a $1,970,000 contract for 8,400 ft of 20-ft to 28-ft reinforced concrete lined and covered canals was 50% finished by the end of the year. Sanitary sewer construction includes $390,000 completed and $130,000 awarded last year; $405,000 worth is to be awarded this year.

• **New York City**—In the program to clean up all its bathing beaches by 1953, New York City had $53,000,000 worth of sewage disposal plant under construction during 1950. And at year's end the situation was this:

26th Ward in Brooklyn, a 60-mgd plant, costing $8,270,000, was 98% completed. It is an activated-sludge process with step aeration. Also in

(*Continued on page 288*)

YOUR
PILE-DRIVING
Dollar

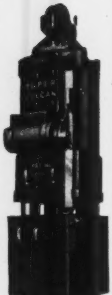
IT'S BIGGER
THAN YOU THINK!

SUPER-VULCAN
OPEN TYPE
DIFFERENTIAL-ACTING
PILE HAMMERS
18C, 30C, 50C and 80C

Super-Vulcan drives piles down faster, easier, and with savings in costs. Twice the blows per minute does the job. And each blow requires 25 to 35 per cent less steam.

Other Super-Vulcan points to consider are rugged strength, durability, simple design, positive action. Together with easy and inexpensive operation, these Super-Vulcan features enable you to drive more piles per dollar.

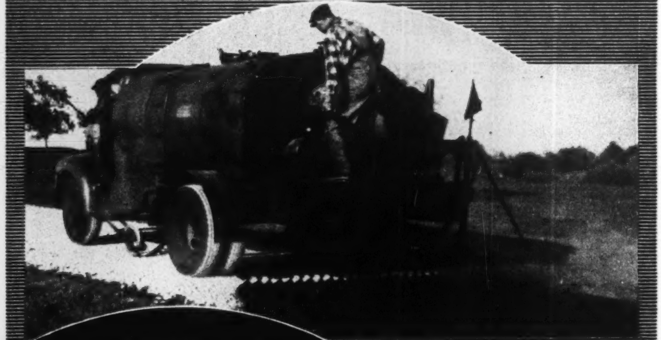
For added economy, the open-type fits the same leads and uses the same accessories as the Vulcan Single-Acting hammers. Write for full details.



Sizes: 18C—30C
50C and 80C
meet all needs.

VULCAN IRON WORKS
Since 1852
331 North Bell Avenue
Chicago 12 --- Illinois

NO TIME LOST!
LOADING OR LAYING ITS LOAD



A STANDARD STEEL PRESSURE DISTRIBUTOR GIVES EQUAL CIRCULATION THROUGHOUT THE SPRAY BAR FOR A UNIFORM SURFACE FROM CURB TO CURB FOR LONGER WEAR

STANDARD STEEL
PRESSURE DISTRIBUTOR

The Model 424 can be loaded in quick time for a "fast getaway". A two-way cleaning system guarantees a clean spray bar at the end of the day. First, the material is sucked out of the bar and back into the tank. Then by turning one small valve, cleaning solvent is released into pump and spray bar (without contaminating the asphalt in the tank). No time lost in tinkering — no time lost in loading — Standard Steel 424 keeps going all day long far ahead of the "gravel gang"

WRITE FOR CATALOG 424

OTHER PRODUCTS OF STANDARD STEEL

Maintenance Distributors, Tar Kettles, Patch Rollers, Supply Tanks, Tool Heaters, Asphalt Tools, Street Flushers, Construction Brooms.

Built to the Highest Standard

PD-1

Standard Steel Works NORTH KANSAS CITY, MO

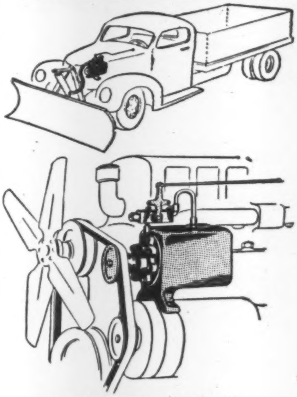
OMEGA

*THE LAST WORD IN FEEDERS . . .*

**— for alum, lime, soda ash, ferric sulphate, sodium fluoride, carbon, and other water treatment chemicals. For Bulletins and complete information, address Omega Machine Company, (Division of Builders Iron Foundry) 390 Harris Ave., Providence 1, R. I.**

**OMEGA**
**MACHINE COMPANY**

**POWER HYDRAULICS for Snow Plows and Road Machinery**



- Clutch operated (Optional)
- Thousands in use
- Fan Belt or Electrically Driven
- Fit All Trucks

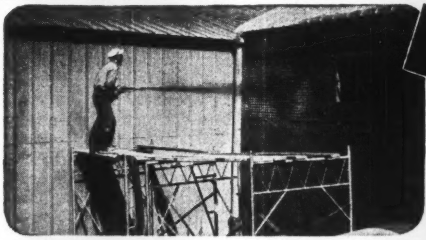
*Specify Monarch controls when ordering snow plows.*

**MONARCH ROAD MACH. CO.**
*322 North Front Ave.*
GRAND RAPIDS 4, MICHIGAN

ABC TUNNEL TUBING
FOR LOWEST COST
VENTILATION

The airtight, mildewproof, abrasion resistant flexible tubing for delivering fresh air to workers. Three types: "A" (double seam suspension), "SS" (single seam suspension), "B" (double seam at top of sides). Sizes: 8" to 36" dia. Hangers and snap-on couplings furnished. Prompt shipment. Send for literature.

ABC AMERICAN
BRATTICE CLOTH CORP.
WARSAW, INDIANA



*Now!* New Opportunities . . . New Profits for You

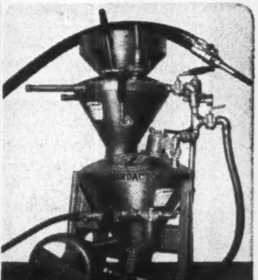
with the **BONDACTOR**

Whether You Call It
- SHOT CONCRETE
- AIR PLACED CONCRETE
- PNEUMATICALLY PLACED CONCRETE

**You Can Do It Better . . . More Profitably**
**with BONDACT Process Equipment**

One of many uses is the application of Vermiculite concrete for insulation and fireproofing by a BONDACTOR, as shown here. Nozzleman is using the BONDACT Gun.

Model 1000 BONDACTOR inset at right.



*Expand and Profit with BONDACTOR These 2 Ways*

**1. New Construction**
Construction with the BONDACTOR is easier, faster, better. It costs less to build . . . and you profit more. *You* get the big savings in time, labor, money . . . and *you* keep the profits. What's more, you can take advantage of new methods and designs . . . and you can build without the use of many critical materials.

**2. Repair and Maintenance**
One unit does the whole job. Use the BONDACTOR for sandblasting, application of sand and cement concrete; insulating (Vermiculite and Perlite) concrete and plaster scratch coats; pumice concrete; refractories, including Haydite and Lumnite cement, ganister and fire clay, castable refractories; and other aggregates and materials.

**Available to Meet Your Needs**
Model #1000-S BONDACTOR Operates with a 105 CFM or larger air compressor.
Model #1000-L BONDACTOR Operates with a 210 CFM or larger air compressor.

See Your Construction Equipment Distributor, or for FREE Catalog, Tear Off and Mail Coupon TODAY

**AIR PLACEMENT EQUIPMENT CO.**
2523 Southwest Blvd., Kansas City 8, Mo.

***To Save and Profit with the BONDACTOR, Act Now!***

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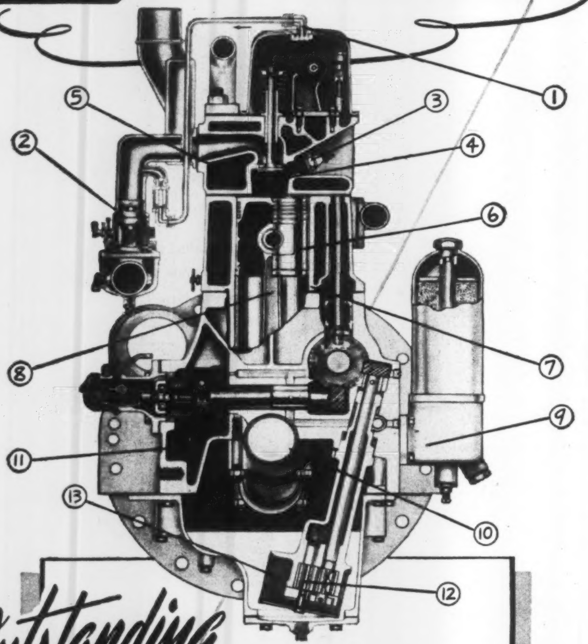
Without obligation, please send me full information about BONDACTOR equipment.
Name____________________
Firm____________________
Address____________________
City____________ State______

MINNEAPOLIS MOLINE
MM
MODERN MACHINERY

INDUSTRIAL ENGINES



Outstanding FEATURE BY FEATURE
because they're DESIGNED FOR DEPENDABILITY

*Advanced* Engineering with *Quality Controlled* production makes Minneapolis-Moline Power Units the superior, heavy-duty power choice. Tested and proved on heavy power application, MM Engines' extra size and weight are an assurance of added years of reliable performance. Moderate engine speeds furnish steady, continuous power which takes advantage of the engine's high torque and helps make MM the best value for low fuel consumption.

Make your next power installation an MM Engine. See your MM Dealer or write MM for the complete story on MM Engines. 25 to 230 h. p. *MM Engines are designed to save you money,* NOW AND LATER!

1. **CRANKCASE**—Vacuum ventilation with metering valve.
2. **CARBURETOR**—Any fuel: gasoline, distillate, natural gas, LP gas.
3. **SPARK PLUGS**—Specially located for maximum performance and accessibility.
4. **CYLINDER HEADS**—Removable, cast in pairs, with high-turbulence combustion chambers.
5. **COOLING SYSTEM**—Controlled, direct to combustion chambers and cylinder walls.
6. **PISTONS**—Cast-iron ground to a fine finish.
7. **CYLINDER BLOCKS**—Removable, cast in pairs.
8. **CONNECTING RODS**—Drop-forged steel, I-section, heat treated.
9. **OIL FILTER**—Replaceable cartridge and safety by-pass valve.
10. **BEARINGS**—Precision, steel shell, babbitt lined.
11. **CRANKCASE**—Rigid design with ample bearing support.
12. **OIL PUMP**—Submerged, gear-driven, located in sump.
13. **OIL SCREEN**—Extra large.

*See your MM Dealer-Distributor or write*

MINNEAPOLIS-MOLINE
MINNEAPOLIS 1, MINNESOTA

**TUBULAR DIFFUSERS to feed air in the activated sludge process are a new addition to a plant at Columbus, Ohio.**

Brooklyn, Owl's Head—an $18,000,000, 160-mgd, high-rate activated-sludge plant—was 22% finished. Hunts Point Plant, Bronx, is a $23,000,000 activated- sludge plant, with step aeration plant to treat 120 mgd—37% finished. In Queens, 15-mgd. Rockaway Beach plant was 21% done; this $5,700,000 installation will use a high-rate activated sludge process.

In 1951, $16,460,000 may be spent on sewage-works construction. About half of this would go toward starting the 80-mgd Bowery Bay extension, an activated sludge plant now in design.

Some $11,000,000 worth of construction was underway for the city during 1950 on destructors and other garbage disposal facilities. Chief among these are: Betts Avenue Destructor, a 800-ton $4,226,000 plant, which was virtually completed at year's end; Gansevoort Destructor, a 1,000-ton $5,121,000 plant which was just started.

• **Oakland, Calif.**—The $24,000,000 program of interceptor and treatment plant construction for Oakland, Calif., and five neighboring cities advanced from 22% to 70% completion during 1950. On the interceptor work, 3 mi of 105-in. cast-in-place sewer and almost 6 mi of reinforced concrete sewer pipe ranging from 42 to 108-in. dia was placed. Contractors earned $8,500,000 for that work. Most spectacular part of this construction work was laying 96-in. pipe for an outfall extending a mile into the water of San Francisco Bay. The $7,000,000 primary treatment plant is progressing to where partial operation is expected by July 1, 1951. The project is administered by Special District No. 1 of the East Bay Municipal Utility District. Completion of the work will mark another big step toward cleaning up the polluted waters of San Francisco Bay.

• **Oregon**—Five pulp and paper mills in the Willamette valley are attempting to meet the Oregon State Sanitary Authority's pollution abatement deadline of May 1, 1952. Crown Zellerbach Corp. is setting the pace by experimenting with a process that uses ammonia and sulphate base for cooking, instead of bisulphate of calcium. At other mills, experiments are being made in pooling wastes during low-water periods, then releasing them during high-water periods, when the swift current carries sulphites away without polluting streams.

Good progress is reported on municipal sewage-plant construction phases of the state's stream pollution abatement program. Portland's $17,000,000 sewage disposal project is the biggest, being 65% complete on Jan. 1, 1951. Completion of the Peninsula Tunnel, main outlet of the system, was the outstanding work of 1950. The treatment plant is 94% completed and the outfall sewer from the treatment plant to the Columbia River is 75% finished. Completion of the entire project, originally set for mid-1952, may be delayed through inability to obtain required material due to defense restrictions.

The State Board of Health reports about $2,500,000 worth of other new municipal sewage treatment plants under construction and the awarding of contracts totaling $6,500,000 for all types of sewage works. During the year bonds totaling $4,280,000 were issued for financing sewerage projects.

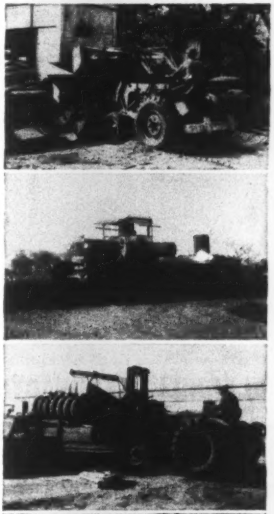
Four new sewage treatment plants were placed in operation and 10 others, designed to serve a population of 586,000 population, were under construction, at a cost estimated at $2,213,000.

A sewage treatment plant under construction at Salem, Oregon's second largest city, in addition to handling normal municipal sewage, will handle industrial waste from 12 fruit and vegetable processing plants, four meat packing plants and several other industrial establishments.

• **Philadelphia, Pa.**—Biggest single addition to the city's sewage disposal system during 1950 came with completion of 125-mgd (activated sludge) Northeast Sewage Treatment Works. Half finished at year's end was the Southwest plant—a $7,100,000, 136-mgd plant on which $2,100,000 is due to be spent this year.

(*Continued on page 290*)

No job too TOUGH!



MINNEAPOLIS-MOLINE
MODERN MACHINERY

INDUSTRIAL WHEELERS

That's right—no job too tough for MM Industrial Wheelers. *You* know the job . . . have your MM representative demonstrate the MM line on *your* job.

MM Wheelers are designed for more work per hour with maximum economy. Front ends with up to 10,000 lbs. capacity and drawbar pulls to 6500 lbs. permit handling of heavy work. Exclusive roller bearing, Ross twin-lever actions make the MM Wheelers the easiest steering tractor you can buy. Extra large clutch plates have over three times rated engine capacity. Transmissions have alloy steel cut gears, oversize tooth surface, heavy shafts with short spans between bearings. High-torque, high-turbulence, valve-in-head engines have been power and economy leaders for years.

Model UTIL is the only industrial wheeler on the market with "*Shuttle Gear*"—6 forward and 6 reverse speeds with instant shifting. Saves time and money on jobs that require high percentage of backing.

See the MM Industrial Wheelers—with the "right" attachments—for the *best* job you've ever had.

*MM Quality Control means Dependable Performance on the Job.*

MINNEAPOLIS-MOLINE
MODERN MACHINERY

MINNEAPOLIS-MOLINE
MINNEAPOLIS 1, MINNESOTA

(*Continued from p. 289*)

Southeast, a 140-mgd plant to cost $5,256,000, is 60% completed and will have $1,575,000 spent on it in 1951. Sludge will be pumped from SE to SW; digested sludge at SW will be disposed of in lagoons.

Construction of interceptor sewers includes: Central Schuylkill West Side Collector, a $2,331,000 job 14% done, on which $2,000,000 will be spent this year; Central Schuylkill East Side Collector, cost $4,421,000, 43% finished, due for $2,531,000 worth of contracts in '51. The $9,387,000 Lower Delaware Low-Level Collector is over 54% finished; work totalling $3,300,000 is scheduled for '51. In addition to over $17,000,000 worth of sewers for new housing under construction, there is an $8,298,000 program of reconstructing old sewers about 10% completed.

• **San Francisco, Calif.**—First parts of San Francisco's new sewage-treatment facilities will go into operation in mid-1951. The 65-mgd North Point plant will be first, to be followed four months later by the 30-mgd southeast plant. Sludge from both plants will be treated at the Islais Creek sludge plant. Contracts in effect Jan. 1

(*Continued on p. 291*)

"Tag Master"

• ADVANTAGES
1. Less Booming
2. Less Swinging
3. Less Travel
4. Control of clamshell
5. Can be used as a Dipper Trip

• BECAUSE
1. Tagline pull can be increased *manually* to cast—twist or snub a clamshell, (or trip a bucket.)
2. *Automatic* setting maintains *uniform* tagline tension at *all* bucket levels.

• USERS REPORT
1. Increased performance
2. Low cost operation

MORIN COMBINATION TAGLINE WINDER AND DIPPER TRIP

There are years of experience behind every "TAG-MASTER."

MORIN MFG. CO.
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Send "TAG-MASTER" details to—
Name ..............................
Address ..............................
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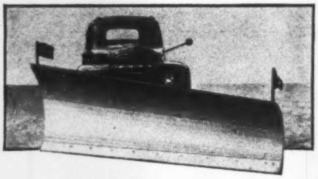
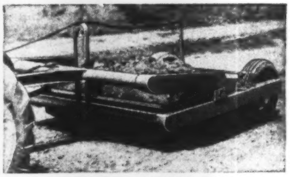
Make—Size & Model of Machine

GET BETTER RESULTS
WITH GLEDHILL EQUIPMENT

FOR ALL AROUND PERFORMANCE
. . . THE YEAR 'ROUND





FROM SNOWPLOWS IN WINTER TO EARTHMOVERS IN SUMMER

GLEDHILL MANUFACTURES A COMPLETE LINE
OF ROAD WORKING MACHINERY

- SNOW PLOWS—V'S, ONE-WAY, REVERSIBLE
- EARTH MOVERS—ONE AND TWO TON
- ROAD MAINTAINERS—DRAWN OR POWER DRIVEN
- BLADE GRADERS—DRAWN TYPE
- TRAFFIC LINE MARKERS

*Write for complete specifications, Dept. EN-3*

THE GLEDHILL ROAD MACHINERY CO.
GALION, OHIO

showed the following completion percentages (figures in parentheses are contract amounts): North Point plant 85% ($8,289,525); influent and effluent lines 87% ($1,039,903); sludge plant at Islais Creek 65% ($4,486,000); southeast plant 75% ($2,132,118); crosstown sludge lines 100% ($388,180).

• **Seattle, Wash.**—The year 1950 saw the completion of a $1,450,000 sewerage system for the Greenwood Ave. Sewer District in a 9,000-acre suburban area just north of Seattle bordering on Puget Sound. The project involved a primary treatment plant to serve an ultimate population of 60,000 people, 57 miles of 8-in. laterals and more than 2 miles of trunk lines up to 27-in.

• **Tacoma, Wash.** – Contract was awarded and work started in 1950 on a $1,327,000 primary treatment plant, scheduled for completion next October.

• **Washington, D. C.**—A $1,267,000 contract for four additional sludge digestion tanks and four additional

(*Continued on page 292*)

BUILD with less steel...
save time and manpower, too

with LIGHTWEIGHT, insulating PERMALITE aggregates

Permalite
Perlite Plaster
Aggregate
GLC
Building Products Division
GREAT LAKES CARBON CORPORATION
NEW YORK • CHICAGO • LOS ANGELES
Permalite
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TION
LOS ANGELES

Industrial buildings, schools, hospitals, defense housing, military buildings – all can be built with *less vital* steel. Lightweight Permalite in place of sand in concrete and plaster will reduce the dead-load of a building as much as 80%. Less steel is needed to support this lighter weight concrete and plaster.

Lightweight Permalite/concrete and plaster are easy to handle – quick to apply. With Permalite, rigid completion dates can be set and met!

Get the *full story* – learn how you can build with less steel and save time and manpower too. Mail coupon today.

NO END OF USES

**CONCRETE:** *Roofs and Floors*—over lightweight decking. *Exterior Walls* – thin, light; easily formed and erected.

Can be monolithically poured or precast into blocks, slabs and panels – can be sawed or nailed!

**PLASTER:** *Fireproofing* – speedily applied over structural steel. *Interior Walls* – replaces sand plaster – at less than half the weight.

see our CATALOG in

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THE LEADING PERLITE AGGREGATE

A Building Product of
Great Lakes Carbon Corporation
and its exclusive Permalite Licensees

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18 East 48th Street, New York 17, N.Y.

Please send full story on Permalite lightweight construction.

NAME ....................................

ADDRESS ....................................

....................................

**Relieving platform, supporting New York's East River Drive, rests on 72,000 creosoted piles. Wood form, pictured here, carries reinforced concrete slab.**

72,000
CREOSOTED PILES
support
Famous Parkway

New York's East River Drive, completed in 1942, is one of the city's most impressive waterfront parkways. It is about 7 miles long, and carries two-way, high-speed traffic in 6 lanes. For a distance of 4.3 miles, relieving platform bulkheads were built along the shore of the East River to support the highway. These relieving platforms rest on approximately 72,000 creosoted timber piles, driven offshore in water 20 to 30 feet deep.

**Permanent . . . Economical**

Pressure-creosoted piles were specified because of their permanence and economy. The pressure-creosoting treatment protects these piles against marine borers . . . also against decay and insect attack where cutoffs are above the water table.

**Write for Quotations**

For projects requiring permanent construction *with economy*, Koppers Pressure-Creosoted Piles may be the best answer. These piles usually cost less than other permanent pile materials. Koppers Piles come in lengths up to 130 feet.

KOPPERS COMPANY, INC., Pittsburgh 19, Pa.

KOPPERS
PRESSURE-TREATED
WOOD

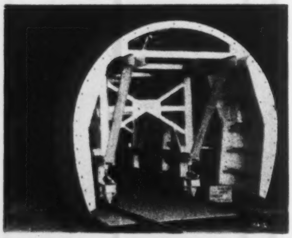
KOPPERS

The
MAYO

PNEUMATIC
"DOUBLE DUTY"
GROUTER!

Put a Mayo Pneumatic Grouter on the job—and you "double up" on hard-to-get equipment! Designed for placing low pressure grout in tunnels, mines, shafts and foundations, this pneumatic grouter can also be readily converted into a pea shooter. Elimination of all moving parts within the grout lengthens equipment life. Write today for free, illustrated bulletin.

MAYO FORMS
*Used All Over the World . . . for Tunnels, etc.*



MAYO
TUNNEL & MINE EQUIPMENT
Robt. S. Mayo — Civil Engineer
LANCASTER, PA.

sedimentation tanks at the District of Columbia sewage treatment plant, on the Potomac River, is still in force, due to be completed April 1. Work has just started on sludge drying and incinerating equipment to cost $736,000 at the D. C. plant.

**Washington State**—Shortage of critical materials put a crimp in the program of the Washington Pollution Control Commission to curb industrial pollution, but many problems were corrected by the installation of municipal sewage-treatment plants. During 1950, twelve cities, one sewer district and a large logging camp completed sewage-treatment installations costing $1,414,406. Fifteen other towns and cities started work on treatment plants costing $2,582,000.

Plans for 1951 indicate that about 21 communities will have projects under way before the end of the year. Four sulphite pulp mills had been ordered to install permanent recovery processes by Sept. 1, 1951. The war situation and the shortage of critical materials has caused the commission to accept temporary arrangements to relieve the condition caused by the waste discharge and to extend the time limit for the permanent facilities to Dec. 31, 1953. These mills now have temporary disposal facilities costing $1,000,000 under construction.

Do
YOU
Need
Help
?

If you are in need of men from general managers to supervisors, an ad in the Classified Section of ENGINEERING NEWS-RECORD will help you locate the men you need.

Low rates for either display or undisplayed copy.

WRITE - PHONE
WIRE

*Classified Advertising Division*

ENGINEERING NEWS-RECORD
330 W. 42nd St. New York, N. Y.

BLADES
AND CUTTING EDGES
*of Superior Quality by*
Shunk

For all makes and types of road building and road maintaining machines. Also —

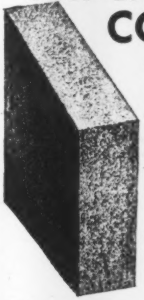
BULLDOZER BLADES
BUCKET LIPS
PATENTED SCARIFIER and ICE and SNOW REMOVAL BLADES
MOLDBOARDS
SCARIFIER TEETH

All widths, lengths, and thicknesses; accurately punched to fit your make of machine.

Write for bulletins and other information.

Shunk
MANUFACTURING COMPANY
*Established 1854*
BUCYRUS, OHIO.

*Servicised*
SELF-EXPANDING
CORK

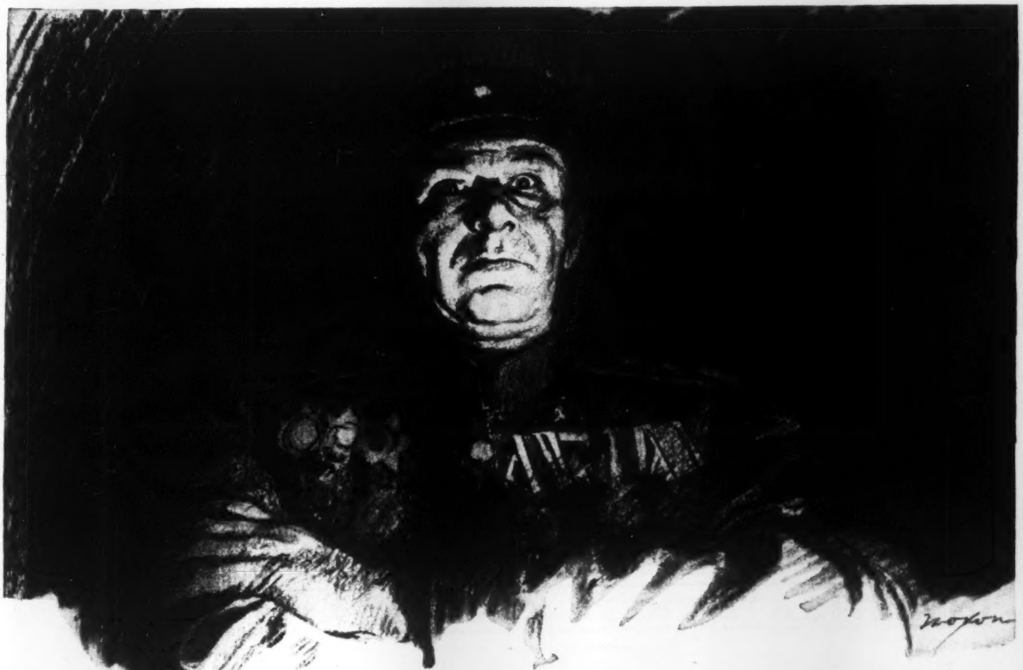


- EXPANDS 150% BEYOND ORIGINAL THICKNESS
- FULLY COMPRESSIBLE
- NON-EXTRUDING AND RESILIENT
- SUPPLIED ½" TO 1" THICK—2" TO 12" WIDE

Self-expanding cork is ideal for large concrete structures or masses where substantial initial contraction is anticipated before any considerable amount of expansion takes place. 150% expansion of Self-Expanding Cork even after full compression, keeps the joint space filled, regardless of concrete movement. Supplied in ½" to 1" thicknesses; 2" to 12" (Standard) widths; also made in 24" and 36" widths on special order.

Write for catalog and complete details on Servicised Joint Fillers and Sealers.

SERVICISED PRODUCTS CORP.
6051 W. 65th ST., CHICAGO 38, ILL.



# IVAN is watching you

IVAN is a dyed-in-the-wool Communist. There are only 6 million party members like him in all Russia, yet these Communist brass-hats enforce the iron dictatorship of the Kremlin over *200 million* Russians.

He's sold to the hilt on Red ideas. Which means he's out to get *you*. He believes it's either you or him . . . that the world is too small for both.

Ivan is working hard to beat you down. He has a big head start.

Right now he's got you in a bad spot.

Ivan is afraid of only one thing.

He fears your ability to out-produce him in guns, tanks, planes.

Frankly, he doesn't think you value your free system enough to do it . . . to make willingly the sacrifices he has squeezed out of the Russians.

But he's wrong!

Because you and all of us have set out to build more and better weapons—to do it faster all the time.

We must use every bit of know-how and inventive skill we have to improve our machines and methods—to turn out more and more for every hour we work. Only in this way can we become militarily strong.

But we've got to supply essential civilian needs as well. We can't allow needless shortages to take prices skyrocketing and lower the value of our dollar.

Sure, that means sacrifices for everybody. But doing this double job well is the only sure way to stop Ivan in his tracks—and to save the freedoms which are ours and which he has never known.

***FREE**. . . this important booklet tells you how our American System Grew Great*

THE MIRACLE OF AMERICA

How Americans developed better machines, power and skills to build a great nation . . . Why we have been able to produce constantly more per hour . . . How this has given us the world's highest living standard.

*How we can meet today's challenge*—Why we must expand our productive capacity . . . supply arms and essential civilian needs, too. Read how this dynamic process works in free booklet, "The Miracle of America," endorsed by representatives of management and labor. Send for your free copy today!

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**New York 19, N. Y.**

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***This advertisement, approved by representatives of management, labor and the public, is published in the national interest***

## McGRAW-HILL PUBLISHING COMPANY

THE BETTER WE PRODUCE
THE STRONGER WE GROW

ENGINEERING NEWS-RECORD

# SEARCHLIGHT SECTION

March 29, 1951

## CATALOG WHERE TO BUY OR RENT used and surplus new

## CONSTRUCTION EQUIPMENT MATERIALS & SUPPLIES

## INVESTIGATE THESE VALUES

**TRACTORS**

3—INTERNATIONAL Model TD18 Diesel Tractors, Bucyrus-Erie Hydraulic Bulldozers. Completely rebuilt. Each $8,900.00

1—CATERPILLAR Model D8, 74" gauge 22" tracks, electric starter, canopy top, crankcase guard with new Caterpillar 8S Cable Bulldozer Blade, LeTourneau DD Power Control Unit. Rebuilt and Guaranteed. $16,475.00

1—CLETRAC Model AG gasoline Tractor. Reconditioned. $1,600.00

1—CLETRAC Model AG gasoline Tractor. Reconditioned. $750.00

1—INTERNATIONAL HARVESTER Model I-6 wheel type tractor with Baker Bulldozer blade. Excellent condition. $3,250.00

**TOURNAPULLS**

3—LeTourneau Super "C" Tournapulls mounted on two 21.00 x 24 20-ply tires with "LP" Scrapers. Reconditioned—ready to roll. Each $6,500.00

**GRADER**

1—CATERPILLAR #11 Motor Grader with scarifier. Reconditioned. $3,750.00

**SHOVEL—CRANE**

1—BUCYRUS-ERIE Model 37B Combination shovel and crane, 60' boom, 24" tracks, D13000 Caterpillar Engine. Machine Serial #15429. Rebuilt and guaranteed. $25,500.00

**TRENCHER**

1—Barber Greene Model 44C Trencher, Serial No. 44-12-35 with Buda Model YBUI gasoline engine. Digs trench 24" wid,e 7' deep. Good condition. A good buy. $3,500.00

**H. O. PENN MACHINERY COMPANY, Inc.**
140th Street and East River New York 54. N. Y.
*Telephone: CYpress 2-4800*

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**FOR SALE**
Koehring Finisher 18' to 26'
**ABERTHAW COMPANY**
133 Southampton St.
Boston 18, Mass.
*Phone Highlands 5-6700*

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**FOR SALE**

Rebuilt 1¼ C.Y. Koehring Shovel Diesel with these attachments—C.Y. Backhoe & 50 foot crane boom.

**J. ANASTASI**
3344 Ft. Independence St., Bronx 63, N. Y.
Night Phone Ki 3-6813

---

**DREDGING EQUIPMENT**

1—Six-inch, Diesel-Powered, Portable, Hydraulic Pipe Line Dredge.

**STOCKBERGER-SEASTROM, INC.**
1409 Madison Avenue, Indianapolis, Ind.

---

**BACKHOES**

**For Immediate Delivery**

1—Lima 34 crawler pullshovel crane combination, gas machine.

1—Lorain 40 crawler backhoe, gas machine.

**HODGE & HAMMOND, INC.**
720 Garrison Ave. New York 59, N. Y.
*Phone: Kilpatrick 2-2400*

---

**FOR SALE**

*Koehring Cement Paver or premixer.* Model 27E, 6 cycling gas motor. Time clock. A-1 condition.

6 to 14 tons. 3 wheel B. S. Rollers.

⅜-2½ yd. shovel.

**WM. C. DOHERTY**
52 Summer Street
Stoneham, Mass.

---

**ALLIS-CHALMERS HD-7 TRACTOR**

- 63" tread, 18' shoes, canopy, starter, Gar Wood hydraulic bulldozer. Mfg. in 1947. In good condition. Cleaned and painted.

Evergreen 3-5000
**EDWAR EHRBAR INC.**
29 Meserole St., Brooklyn 6, N. Y.

---

**TRENCHER**

Buckeye—C-10-A
Set for 14 ft. x 30 in.
**DELANEY EQUIPMENT CO.**
19150 John R St. Detroit 3, Mich.

---

***FOR SALE***

Shovel Front Attachment complete for B-E. 10-B S/N 12382-A-719

**MANWARING MACHINERY CO., Inc.**
1202 West 27th Street
Indianapolis 23, Indiana

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**FOR SALE**
**Barnes Model 30 Roadbuilders Water Pump**
A-1 Condition
**J. F. MORGAN COMPANY**
P. O. Box 286 Ithaca, New York

---

FOR SALE
**12 INCH DREDGE**

Diesel, now working in east, with good contract.

FS-9316, Engineering News-Record
330 W. 42 St., New York 18, N. Y.

# L.B.SMITH INC.

## OFFERS

### AIR COMPRESSORS

Schramm 105 cubic foot gas powered compressor on 4 steel wheels.
Ingersoll-Rand 105 cubic foot, Waukesha gasoline power, on two rubber tires.
Gardner-Denver 160 cubic foot gas powered compressor on 4 steel wheels.
Worthington 210 cubic foot, two-stage, air-cooled, on steel wheels with Hercules diesel.
Pennsylvania 12" x 10" class 3A single cylinder, 355 cubic foot P.D., flat belt driven 50 HP slip ring motor.
Worthington two-stage, water-cooled, vertical 250#, 60 CFM, new condition.

### QUARRY EQUIPMENT & BINS

Cedarapids BBB scalping unit with 1036 jaw.
10x7 Allis-Chalmers Blake type jaw crusher.
#1 Cedarapids Kubit impact breaker.
1036 Cedarapids jaw crusher, new condition.
4' x 12' Tyler F600 double deck screen.
3'x10' revolving screen.
16" x 90' bucket elevator.
60-ton, 2-compartment, 8'x18' storage bin with clamshell gates.
Conveyors—18"—24"—30"—36". Also belt.

### TRUCKS—TRAILERS

1½-ton Ford with any body.
2½-ton GMC, rebuilt.
1949 White Model WC26 dump trucks, new condition.
2000-gallon tanks on semi-trailer mounting.
New and rebuilt dump bodies.
2,000 gallon tanks on semi-trailer mounting.
New and rebuilt dump bodies.

### GENERATORS & LIGHT PLANTS

1½ KW to 125 KW, alternating and direct current, gasoline and diesel powered.

### GASOLINE AND DIESEL ENGINES

Buda, Hercules, Hill diesels, rebuilt.
New and rebuilt Murphy diesels.
GM 6 and 12 cylinder diesels, practically new.

### SHOVELS—CRANES

Lorain 75B, 1¼ yd. shovel, diesel power.

Lorain 55B gas powered crane.

P&H Model 625A 15-ton crawler crane.

Brownhoist 1-yd. gas shovel and crane.

Lorain 30 combination ½ yd. shovel, hoe & clam.

### SHOVEL & CRANE ATTACHMENTS

Lorain 41 shovel attachment new condition.
Lorain 75B-77 1½-yd shovel attachment rebuilt.
P&H 203 shovel attachment.
Chain crowd Lorain 30A shovel attachment.
Lorain 40 Hi-Lift shovel attachment.
Bucyrus-Erie 1½-yd. rock bucket.
Koehring 301 dragline fairlead.
Lorain 75 fairlead.

### Backhoe Buckets & Attachments

¾-yd Lorain, 40, LBS #6105. 44" cutting width, teeth, sheave.
26" outside width solid bottom type LBS #4377, good condition.
¾-yd Amsco 40" cutting width, LBS #6101.

### CLAM—DRAG—SCRAPER BUCKETS

### NEW TAGLINES

McCaffrey Model 648 for 1¼ to 2-yd crane.
McCaffrey Model 636 for ¾-yd to 1-yd crane.

### SHOVEL DIPPERS

Lorain 41, ¾-yd. LBS #7433, rebuilt.
New Lima 1-yd, Amsco, LBS #2295.
Bucyrus-Erie 1¼-yd gas air, LBS #3782, fair.
Lorain 75 manganese 1¼-yd, LBS #7233. teeth and bail.
Lorain 75B, 1¼-yd extended lip, 1¾-yd LBS #2260.
Pettibone-Mulliken 2-yd Lorain 82 or 820, manganese, LBS #5361.
Pettibone-Mulliken 2-yd for 3500 Manitowac LBS #5763.
Esco 2½ yd cast weld dipper with bail & teeth

### CONCRETE ROAD BUILDING & MISCELLANEOUS CONCRETE HANDLING EQUIPMENT

#### Concrete Finishers

Jaeger type "L" double screed, 10½'-12½', rebuilt.
Heltzel 10'-12' finisher, rebuilt.
Blaw-Knox gas-electric 10½'-12½', rebuilt.
2 Koehring 10'-12', rebuilt.

#### Concrete Road Forms

830'—Truscon 7"x8" forms, with stakes.
1380'—Heltzel 7"x8" forms, with stakes.
1220'—Heltzel 9"x8" forms with stakes.
1430'—Heltzel 10"x8" forms, with stakes.

#### Fine Grade Machines

Flynn surgrader 10'-12', rebuilt.
R.B. Fine Grader for 21' width, rebuilt.

#### Form Graders—2 of each

Cleveland formgrader, new condition.
Carr formgrader, new 1944, rebuilt.

### WELL DRILLS & TOOLS

Sanderson-Cyclone #42 well drill, new.
Sanderson-Cyclone #44 well drill, new.
Sanderson-Cyclone #40 well drill with drilling tools, excellent condition, mounted on K5 International chassis.
Bucyrus-Erie 21W on C30 International chassis.
Bits—Stems—Bailers—Sockets—Etc.

### DITCHERS

Barber-Greene 44C Trenching Machine 18" to 24" cutting width, 7' depth.

### GRADERS

New Warco D76 tandem driven grader, 12' blade, V-type scarifier, 13.00x24 tires all around, 24,500 lbs., International UD14A diesel engine.
Austin Western 77 tandem drive, scarifier, 12' blade, gas power, hydraulic controls.

*Phone* **HARRISBURG, PA. 7-3431**

LASTING · BONAFIDE · SERVICE
L. B. SMITH, Inc.

**L.B.SMITH INC. CAMP HILL, PA.**
**SUBURB OF HARRISBURG**

**WE OWN THE EQUIPMENT WE ADVERTISE**

# DIESEL POWER

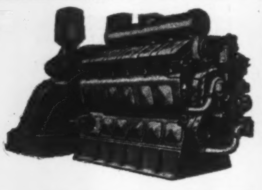
FOR

IMMEDIATE SHIPMENT

UNIT CAPACITIES—10 TO 1875 KVA

A.C.—50 AND 60 CYCLES

VARIOUS VOLTAGE



## A PARTIAL LISTING OF OUR INVENTORY

| KVA | Make | Model | HP | RPM | KVA | Make | Model | HP | RPM |
|---|---|---|---|---|---|---|---|---|---|
| 1875 | Fairbanks Morse | 33F16 | 2000 | 300 | 375 | Enterprise | DSG-6 | 450 | 450 |
| 1420 | Fairbanks Morse | 38D8⅛ | 1600 | 720 | 330 | Superior | KNA | 396 | 514 |
| 1250 | General Motors | 16-278A | 1600 | 720 | 312 | General Motors | 8-268A | 450 | 1200 |
| 937.5 | General Motors | 12-567 | 1080 | 720 | 312 | Clark | MD-4 | 375 | 327 |
| 625 | Alco | 6-12½x13T | 750 | 600 | 125 | General Motors | 3-268A | 150 | 1200 |
| 425 | Baldwin | VO-6 | 510 | 450 | 75 | General Motors | 6043C | 90 | 1200 |
| 400 | Buckeye | 80 | 480 | 600 | 62.5 | Int'l Harvester | UD-18 | 76 | 1200 |

D.C. UNITS ALSO AVAILABLE

**A. G. SCHOONMAKER COMPANY, INC.**

DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

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## *FOR SALE*

# LATE MODEL BARBER-GREENE ASPHALT PLANT

100 TON COMPLETE HOT MIX PLANT, WITH DUST COLLECTOR. CATERPILLAR DIESEL POWERED. SKID-MOUNTED TANKS WITH STEAM COILS. 150 H.P. HORIZONTAL BOILER AND USUAL AUXILIARY EQUIPMENT. THIS PLANT IS IN EXCELLENT CONDITION AND CAN BE SEEN OPERATING. WRITE OR CALL

**SOUTHWEST GENERAL CONSTRUCTION COMPANY**

426 RESERVE LOAN LIFE BLDG., DALLAS, TEXAS    PHONE: RANDOLPH 9215

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### For Sale—Like New

1—General Electric Generator, Model 12G308, alternating type, 3 phase, 60 cycle, 50KW, powered by UD18 International Harvester Diesel Engine.
1—D8 Caterpillar Motor, D13000.
1—D7 Caterpillar Motor, D8800

### New Parts for:

TD18, TD14, TD9, International, Caterpillar & Allis Chalmers. Also have Fairleads, Power Control Units & Cutting Edges.

### Bargain

1—TD18 International Tractor, complete with bulldozer blade.
1—D7 Caterpillar, Hydraulic.

**Julius Hebenstreit, Inc.**

56-15 58th St.    Maspeth, L. I., N. Y.

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## FOR SALE

45 ton G. E. diesel elec. locomotive
15 ton Davenport diesel locomotive
25 ton Browning loco crane new 1942
Two Colby 50 ton gantry cranes
110 HP American 3 drum gasoline hoist
1½ Blaw Knox clamshell buckets new
8¼ x 10 Clyde 3 drum steam hoists new
¾ yd Bucyrus 20-B diesel crane
5 new International T-D-24 tractors

**MISSISSIPPI VALLEY EQUIPMENT CO.**

509 Locust St.    St. Louis 1, Mo.

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### LOCOMOTIVES

1—Davenport 35 Ton Diesel-Elec. Std. Ga.
2—Whitcomb Gas 24" Ga.—6 Ton.
Brookville—10 Ton Diesel—30" Ga.—Used 900 Hrs.

### COMPRESSORS

Worthington 15 x 9½ x 12, 659 CFM @ 100#, G.E. 125 HP 3/60/440.
Synchronous Motor & Accessories, Serial #L-41659.
4—C-P, 14 x 12, 528CFM.

### LOCOMOTIVE CRANES

Browning 20 Ton Steam-Oil Fired.
1—Ohio—35 Ton—#4189—NEW 1942—Oil Fired.
BURRO Mod. 20-6 TON & 30-8 TON.

### MISCELLANEOUS

2—Garwood 18-24 Yd. Scrapers. Cable operated.

A.C. 600KW-2300/3/60 Generator direct connected Superior 800 HP Diesel. Rare Bargain.

**R. H. BOYER**

2005-13 W. Bellevue St.    Phila. 40, Pa.
Phone Sagamore 2-7132

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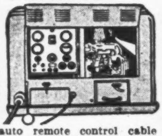
## LIGHT PLANTS

*Brand New!*
*War Surplus*
Signal Corps
Power Unit PE 197



115v 60 cy. A.C. single ph. 5 K.W. Hobart, water cooled, 14 h.p. 4 cyl. Hercules engine. **Remote Control**, complete panel board with instruments. 150 ft. auto remote control cable with reel; 150 ft. #6 hvy. duty wire with reel; housed in metal case with replacement parts & tools. Cable with reels alone worth $400. Reg. price of unit $1900. Shipping wt. 1250 lbs. Our price, complete...... f.o.b. Chicago **$895.00**

WRITE FOR ILLUSTRATED FOLDER

**WELLWORTH TRADING CO.**

1831 S. State St.    Dept. ENR    Chicago 16, Ill.

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## FOR SALE

2 Yd. Lima Model 802
1¼ Yd. Lorain
2 Yd. Northwest #8
3½ Yd. Lima 1201
3 Yd. Monogahan
35 Ton Whirley Electric
10 Ton Krane Kar
35 Ton Stiff Leg Derrick
3 Drum Steam Hoist 10½ x 14 Chests
10 to 50 ton Gantry Cranes
10 to 60 ton Locomotive Cranes
15 ton Truck Crane #3 Northwest
20 Ton Truck Crane General
Locomotives & Cars
25 Yd. LeTourneau Scrapers
5 to 32 Yd. Wagons
Hammers Vulcan #2-3-3000 — McK.T. #4-5-6-7-9B2—E2 Extractor Pumpcrete Machine
¾ Yd. Bhoe attachment Lima
Bins — 10 to 450 ton — 200 barrel to 750 Brl.
10" Hydraulic Dredge

**STONE THE CRANE MAN**    1132 Prudential Bldg., Buffalo 2, N. Y.

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**BOILERS:** 1—Erie City 150 H.P., ASME code, HRT 150 lbs. pressure, 4" x 18' tubes, complete with all fittings. Located Pottsville, Pa. 2—Vogt 220 H.P., 3 drum, low head, National Board, 160 lbs. pressure, complete with all fittings. Located Saginaw, Mich.

**BUCKET ELEVATORS:** 2—Link Belt, boot type, fully enclosed, continuous 62' 10", buckets 11-⅝" deep, 8" projection, 16" wide, on Tesco manganese steel chain. Drawing available. Located Pottsville, Pa.

**CAR PULLER:** Lidgerwood single drum, 5 H.P., 440 volt, slip ring motor and controls.

**CLAM SHELL BUCKET:** Blaw Knox 2 yd. capacity, NEW condition.

**COMPRESSOR:** Worthington 29 x 21 x 23 with 600 H.P. synchronous motor.

**DIESEL MOTOR:** 1—Caterpillar D13000 diesel power unit, 122 H.P., complete with clutch and V belt pulley. Located Saginaw, Mich.

**SCREW CONVEYOR:** 1—12" x 22 ft. with center bearing, 87 RPM, capacity 30 TPH. Located Pottsville, Pa.

**CRUSHERS, GYRATORY:** Various makes, size 12" x 44" up to 42" x 134".

**CRUSHERS, JAW:** Various makes, 8" x 5" to 48" x 60".

**CRUSHERS, REDUCTION:** Symons 2 ft. and 3 ft., each with standard bowl. Telsmith 2 ft. and 3 ft. Gyrasphere. Traylor 4 ft., type TY.

**CRUSHER SPECIALS:** 1—Allis Chalmers Superior 30" and one 7-½ K, Gyratory. 1—Farrel 18" x 36" Jaw.

**DRAG SCRAPERS, CRESCENT BUCKETS:** 1—Sauerman 2 yd. Drag Scraper Outfit, complete, without 75 H.P. motor. 1—Sauerman ¾ yd. capacity complete with motor. 1—Sauerman 1 yd. capacity, complete with diesel motor.

**DRYERS & KILNS:** 5 ft. x 40 ft. up to 10 ft. x 90 ft., single and double shell.

**PULVERIZERS:** 2—Raymond 5 roller high side Mills, oil journals, with double cone separators, fans, collectors and piping. 1—Hardinge Mill 5' x 22", heavy cast shell, motor driven feeder, with 30 H.P. Master gear head motor and control. Located Columbia, Pa.

**NODULIZER:** 1—8'6"-10'0"-8'6" x 50 ft.

**VIBRATOR FEEDER:** Syntron #F55, flat pan trough, 36 x 78".

**SCREENS:** 1—Rotary, heavy duty, scalping Screen, 6 ft. dia. x 12 ft., open end, roller type. 1—Allis Chalmers 5 ft. x 14 ft., single deck. 1—Tyler Hummer single deck, 3 ft. x 5 ft., V-16 vibrator, 220 volt, with Thermionic power converter, NEW condition.

**MINE HOISTS:** Single and double drum, 150 H.P. to 2500 H.P.

**SHOVELS & DRAGLINES:** 1—Bucyrus Erie 120-B, 4 yd. electric Shovel; also, one Bucyrus Erie 170-B, 6-½ yd. electric, 3 phase, 60 cycle, 2200 or 4000 volt. 1—Lorain model 57, diesel Shovel, 1¼ yd. capacity.

**A. J. O'NEILL**

Lansdowne, Pa.
*Phila. Phones: Madison 3-8300—3-8301*

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### FOR SALE *CHEAP*

3—15 ton Whitcomb gas Loco. Std. gauge.
1—50-ton Porter Loco. 0-6-0 Std. gauge. 1942.
1—Schramm Diesel 315 cu. ft. 2 stage comp. 1947.
1—LeRoi 315 cu. ft. 2 stage comp. 1942.
1—6" 2—4" 1—2" Humdinger self priming pumps on steel wheels.

**HARRY C. LEWIS**

899 East Grand Street    Elizabeth, N. J.

---

## Bucyrus Erie V-170 Scraper

- With four 21:00 x 26, 20 ply pneumatic tires. Mfg. in 1950. In new guaranteed condition.

Evergreen 3-5000

**EDWARD EHRBAR INC.**

29 Meserole St.    Brooklyn 6, N. Y.

---

## Scoopmobiles & Buggymobiles

*NEW & USED*

For Sale or Rent

**HODGE & HAMMOND, INC.**

720 Garrison Ave.    New York 59, N. Y.
Phone: Kilpatrick 2-2400

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FOR SALE

**New #36-9300 Simplex Double Leverage Pipe Push & Pull Jacks with ¾" to 4" Jaws & Pilots.**

**ABERTHAW COMPANY**

133 Southampton St.    Boston 18, Mass.
*Phone Highlands 5-6700*

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VULCAN

PILE HAMMERS AND EXTRACTORS
NEW OR FACTORY REBUILT
FOR SALE • • • FOR RENT
327 N. BELL AVE., CHICAGO, ILL.

# FURNIVAL
## 4-WAY SERVICE

*A really complete service*

**CONSTRUCTION and INDUSTRIAL EQUIPMENT**

**3 CONVENIENT LOCATIONS**

## USED EQUIPMENT

**SALE OR RENTAL**
***IMMEDIATE DELIVERY!***

•

- 3—Allis Chalmers HD 10 W Tractors equipped with Gar Wood Blades.
- 3—Super "C" Tournapulls with Cummins Engines.
- 1—Caterpillar D-7 Tractor, equipped with LaPlant Choate Angledozer.
- 1—Caterpillar D-4 Tractor, equipped with LaPlant Choate Angledozer.
- 1—Wooldridge BB85 11 yd. Carryall Scraper.
- 1—Super "C" Tournadozer.
- 1—Rex 34E Dual Drum Paver.
- 1—Mixermobile 2 yd. Drum, 35" tower, 10" extension.
- 3—Agricats (small crawler tractor), with attachments.
- 1—Bell Prime Mover.
- 1—ME-100 Marine Murphy Diesel.
- 1—Domestic DD Hoist—gas.
- 1—OK DD Hoist—gas.
- 1—Model "B" Scoopmobile.
- 1—Duo-Way Scoop.
- 1—Case Tractor Hough FE Loader.
- 1—⅜ yd. Blaw Knox Single Line Clam Bucket.
- 1—GKA-160 Ingersoll-Rand Compressor, 2 wheel home made mtg.
- 1—25-IG American Hoist.
- 1—105-2 Stage Model "A" Ingersoll-Rand Compressor.
- 1—Wonder Plaster Mixer.
- 1—Lombard gas. Chain Saw.
- 1—2 yd. Rex Moto-Mixer.
- 3—Athey Wagons—Model EB32.

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A complete fleet of new and dependable used equipment for your rental needs.

In addition to "usual heavy equipment" the Furnival Machinery Company has available dependable concrete and material handling equipment, such as the Pumpcrete, Mixermobile, Towermobile, Hoists, Scoopmobiles and Portable Material Towers. This equipment is available to you on a daily, weekly or monthly basis; and if you want to cut costs and increase production, feel free to call us at any time.

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The manufacture and reconditioning of pneumatic tools accessories.

Take advantage of today's newest and most complete shop facilities for reconditioning, manufacturing or repairing your rock-drill equipment, tools and accessories! This service includes sharpening, reconditioning and heat treating of Jackbits; resharpening Carset Jackbits; shanking and rethreading Jackrods; sharpening and heat treating drill steels, moil points, etc. Furnival service also covers complete blacksmith work for hand tools such as picks, pinch bars, goose-neck bars and chisels. All work comes under the immediate supervision of highly skilled and experienced staff of graduate engineers, with years of successful "know how" in shop and drilling methods. So call upon us for any information you may wish, with the assurance that your inquiry entails no obligation!

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*Representing leading manufacturers of quality equipment.*

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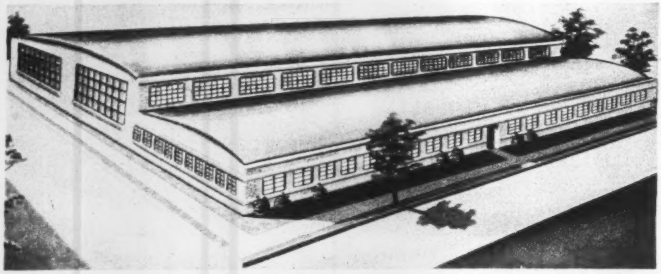

In our new daylight plant on the Southwest Highway, just outside the southwest city limits of Chicago, on seven acres of land, served by three belt line railroads, and with our same experienced personnel, we are in a better position than ever before to offer the construction industry of America:—

## DEPENDABLE USED MACHINES

CRANES, SHOVELS & HOES
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- Speeder LS-60 dragline
- Lorain 40 shovel
- Moore 1 yd. Speed crane
- Browning 20 ton crane
- Link Belt K-35 crane
- Universal truck crane
- Michigan T-6-D truck crane

SHOP CRANES & LOADERS
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- Silent Hoist Krane Krawler
- Ruger floor crane
- Claktor with Hough loader
- Butler Carscoop

CRUSHERS, etc.
- Diamond 24x36 jaw crusher
- Diamond 9x18 port. plant
- Pioneer 9x36 port. plant

SAND & GRAVEL PUMPS
- Erie 8"
- Morris 10"

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- Waukesha 6MZR
- Case Model L
- Climax Model TU

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- Badger on full cats
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- and all accessories

MISCELLANEOUS
- Eagle bucket loader
- Galion Jr. Patrol grader
- RD-7 with bulldozer
- Brookville 3 ton locomotive
- Sauerman ¾ yd. slackline
- Rex truck mixer
- Pioneer 4x10 screen
- Gradall excavator
- Day #5 hammermill
- ½ yd. single line bucket

**10002 Southwest Highway** **TRACTOR & EQUIPMENT CO.** **Oak Lawn, Ill.**

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**Located near**
**Cherry Creek Dam, Denver, Colorado**

| | Price each |
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| 9—**Model 9LDT**, 25-yard Euclid center dump trucks | $27,500.00 |
| 1—**9BVD Euclid loader**, 54" carrier powdered with NHSIB Cummings engine. | 20,000.00 |
| 6—**60-inch** double drum McCoy sheepsfoot rollers | 2,250.00 |
| 3—**DW-10** Caterpillar Model IV4 tractors equipped with 5400 gallon semi-trailer water tanks | 10,000.00 |
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| 1—**Worthington** 10-inch vertical pump, 90-ft. casing and drive shaft | 600.00 |
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| 1—**McCoy** rock dozer | 450.00 |
| 1—**Esco**, 3-yard bucket, Serial #2058 | 850.00 |
| 1—**Esco**, 3½-yard bucket, Serial #2156 | 1,000.00 |
| 1—**Esco**, 5 yard bucket, Serial #2595 | 2,000.00 |
| 1—**Esco**, 4½-yard bucket, Serial #2770 | 1,875.00 |
| 1—**Esco**, 4½-yard bucket, Serial #2692 | 1,875.00 |
| 1—**Hendrix**, 5-yard bucket, Serial #6316 | 1,450.00 |
| 1—**Owen** clamshell, size 146, Type M, Serial #9530 | 1,000.00 |
| 1—1¼ **Hendrix** dragline bucket | 475.00 |
| 3—**McCoy** double drum sheepsfoot rollers, Bureau of Reclamation Specifications | 4,200.00 |
| 2—**10-ton White** trucks with 2,000 gallon water tanks and sprinkler bars | 4,500.00 |
| 1—**Woolridge** ripper, medium size | 1,000.00 |
| 1—**Williams** Jumbo #5 Hammer mill crusher | 1,000.00 |
| 1—**Single** drum tamping roller Model 10-S, drum size 44", width 55" | 450.00 |
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| 1—**Dempster** 8" Centrifugal pump | 775.00 |

All machinery quoted is cash on delivery, net to us F.O.B. cars, Denver, Colorado, and is subject to prior sale or disposition.

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ELECTRIC GANTRY CRANES—up to 50 tons capacity.
CRAWLER CRANES—Diesel and Gasoline —up to 60 tons capacity.
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HOISTS—Gasoline and Electric—up to 150 H. P.
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### FOR SALE

2 drum THOMAS A.C. Electric Hoist with 60 h.p. Motor.

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LE TOURNEAU SUPER-C

## MOTOR SCRAPER

- with 6 cyl. CUMMINS 150 H.P. DIESEL ENGINE. 21:00 x 24, 20 ply front tires, 18:00 x 24, 16 ply rear, 12 cu. yd. struck capacity. Starting equipment, no batteries. Mfg. in 1942. In very good condition.

*Evergreen 3-5000*

**EDWARD EHRBAR INC.**
**29 Meserole St. Brooklyn 6, N. Y.**

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1—362 Marion Dragline, 50' boom, 28" treads, 13 x 11, light plant, air controlled, hook rollers. Price: $18,000.00. A-1 condition
1—95 Northwest Dragline
1—78 Northwest Shovel
1—80D Northwest Dragline
2—D-8 Tractors, straight blades, Serial Nos. 2U948 and 8R6134
3—54B Bucyrus-Erie Hifront Shovels
1—802 Lima Standard Front
1—93M Marion
1—1201 Lima Standard Front, 3½ yd.
1—34 Lima Paymaster
15 and 22B Bucyrus-Erie Shovels

FOR RENT OR SALE 1 Buff Builders' and Mining Transit, Serial No. 28904, with auxiliary gun, used twice.

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### FAIRBANKS-MORSE DIESEL ENGINE MODEL 44-HE10

300 h.p. for 5W Bucyrus-Monighan Dragline. This engine rebuilt under supervision of Fairbanks-Morse engineers and not used since being rebuilt. Details furnished upon request.

FS-9170, Engineering News-Record
330 W. 42 St., New York 18, N. Y.

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### FOR SALE

**4500 Manitowoc Dragline**
**1201 Lima Shovel & Dragline**

FS-9306, Engineering News-Record
330 W. 42 St., New York 18, N. Y.

# SWABB FOR RELIABILITY

## IN USED AND REBUILT

## CONSTRUCTION EQUIPMENT

**625 Page Diesel (two engine) Walking Dragline;** with 150′ boom, 8 yd. bucket.

**621-S Page Diesel (two-engine) Walking Dragline;** with 135′ boom, 6-cy. bucket. Completely rebuilt.

**618 Page Diesel Walking Dragline,** with 110′ boom, 5-cy. bucket. Excellent condition.

**4500 Manitowoc Dragline,** with twin G.M.C. Diesel Engines, 120′ boom, 5-cy. bucket, extra 20′ boom section. Excellent condition.

**2000 Lima High Lift Shovel,** with 65′ boom, 45′ dipper handle, 4½-cy. dipper and Cooper-Bessemer engine.

**111-M Marion Shovel,** with twin G.M.C. Diesel engines, 3½ to 4-cy. machine. Worked about 2 years. Excellent condition.

**1055 P&H Dragline,** equipped with 80′ boom, 4-cy. bucket and Cummins diesel engine.

**1201 Lima 3½ yd. Shovel.** Fine condition.

**1201 Lima Dragline,** with 100′ boom, 2½ yd. bucket.

**1201 Lima Dragline,** with 85′ boom, 3 yd. bucket.

**3500 Manitowoc Dragline,** 80′ boom, 2½ yd. bucket. D17000 Caterpillar Engine. Excellent Condition.

**1001 Lima Dragline,** with 80′ boom, 2½-cy. bucket; Waukesha diesel engine.

**955 P&H L.C. Dragline,** with 90′ boom, 2½ and 3-cy. buckets and Buda diesel engine.

**595 Link-Belt Dragline,** equipped with 85′ boom, 2½-cy. bucket and Cat. D-17000 diesel engine. Excellent condition.

**585 Link-Belt Dragline,** with 80′ boom, 2½-cy. bucket and Cat. D-17000 engine. Good condition.

**48-B Bucyrus-Erie Dragline,** equipped with an 80′ boom, 2½-cy. Medium bucket and Buda-Lanova diesel engine. Used very little.

**54-B Bucyrus-Erie Combination High Lift Shovel & Dragline.** 45′ boom, 34′ dipper handle, 2 yd. dipper; and 80′ drag boom, 2½-cy bucket; Buda diesel engine.

**54-B Bucyrus-Erie Diesel Dragline,** 90′ boom, 2½ yd. bucket.

**802 Lima Dragline,** with 80′ boom, 2-cy. bucket, Cat. D-17000 diesel engine (1200 hrs.), wide treads and long crawlers. 1946 machine.

**44-B Bucyrus-Erie Shovels,** equipped with 2-cy. dippers.

**604 Lima 1½-cy. Shovel** equipped with 23′ boom, 18′ stick and Cummins or Caterpillar D-13000 engines. Excellent Condition.

**34 Lima Shovel**—1-cy. dipper, 18′ boom, 15′ stick, long crawlers, 30″ treads, G.M.C. diesel engine. 1948 machines. Excellent condition.

**D-8 Caterpillar Hydraulic Angledozers,** in 8-R series. Completely overhauled.

**D-7 Caterpillar Bulldozers,** cable operated, in 4-T and 7-M series. Completly rebuilt; with Hyster Winch.

**42-T Bucyrus-Erie** Diesel Blast Hole Drill with Jacks.

**Loomis #44 Clipper Well Drill,** with 40′ steel mast, ″ drilling equipment.

**NEW PAGE BUCKETS**—6½, 5, 4, 3, 2½ and 1¾ cy. One used 4½ cu. yd. Page Dragline Bucket; Two used 7 cu. yd. Bucyrus-Erie "Red Arch" Dragline Buckets, in A-1 shape;

One used 8-cy. Type RHD Page Dragline Bucket.

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Hazleton National Bank Bldg., Hazleton, Penna.

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INDUSTRIAL RUBBER PRODUCTS FOR EVERY PURPOSE

IMMEDIATE DELIVERY OF CONVEYOR, ELEVATOR AND TRANSMISSION BELTING — FIRE, WATER, SUCTION, AIR, STEAM AND WELDING HOSE

*WHY WAIT*

## We have 8 to 48 RUBBER CONVEYOR BELTING

**TOUGH COVERS**—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength. Thoroughly capable of withstanding the abrasive action of bulk materials. Properly vulcanized to the carcass to assure utmost performance, economically.

**STRONG CARCASS** — Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply thoroughly embedded in rubber to prevent ply separation.

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*Avoid delays in your production schedules!*

We carry in stock for your immediate requirements, Conveyor Belting in widths from 8 inches to 48 inches.

| Width | Ply | Thickness Top Cover | Thickness Bottom Cover | Type of Duck Carcass |
|---|---|---|---|---|
| 8" | 4 | 1/16" | 1/32" | 28 Oz. |
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| 12" | 4 | 1/16" | 1/32" | 28 Oz. |
| 14" | 4 | 1/16" | 1/32" | 28 Oz. |
| 16" | 4 | 1/8" | 1/32" | 28 Oz. |
| 18" | 4 | 1/8" | 1/32" | 28 Oz. |
| 20" | 4 | 1/8" | 1/32" | 28 Oz. |
| 20" | 5 | 1/8" | 1/32" | 28 Oz. |
| 24" | 4 | 1/8" | 1/32" | 28 Oz. |
| 24" | 5 | 1/8" | 1/32" | 28 Oz. |
| 26" | 5 | 1/8" | 1/32" | 28 Oz. |
| 30" | 4 | 1/8" | 1/16" | 32 Oz. |
| 30" | 5 | 1/8" | 1/16" | 32 Oz. |
| 30" | 6 | 1/8" | 1/16" | 32 Oz. |
| 36" | 6 | 1/8" | 1/16" | 32 Oz. |
| 42" | 5 | 1/8" | 1/16" | 32 Oz. |
| 48" | 8 | 1/8" | 1/16" | 32 Oz. |

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- powered by Waukesha 6 cyl. engine, with remixer powered by Le Roi gas engine on skids, 8" pipe and fittings as follows: 40-10' sections, 4-5' sections, 3-3' sections, 3-2' sections, 1-1' section, SIAMESE section, adapter section, pin type valve, discharge end, etc., to make up complete operating unit. In good condition.

***Evergreen 3-5000***

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- 9—LeRoi Model DP-176 Gasoline Power Units (New)
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- 1—Worthington Model 105 Air Compressor on 2 pneumatic tired wheels
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NORTHWEST 25 Dragline, diesel #10290
LORAIN 820 Shovel, 17000 Series
LORAIN MC-414 Moto-Crane, 20 Ton, 1948 Model
NORTHWEST 80-D Shovel, 8900 Series
NORTHWEST 78-D Shovel, 6900 Series
NORTHWEST Model 6 Shovel or Crane
MANITOWOC 3500 Dragline—Shovel Attachment Available
INSLEY Model K-12 Crane or Backhoe
BAY CITY ¾ Yd. Crane, 35' Serial 4767
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BUCYRUS-ERIE 22-B Shovel, Factory New
MONIGAN 9W—200' Boom
NORTHWEST 95 Dragline, Murphy Engine—$19,000.00

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TD-6 Bulldozer—Hydraulic
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1—Ingersoll Rand Compressor 480CMF—Imperial Type XB—RH 41820PP—16x14—LH 41819 PP—10x14—100 et. pressure

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**1—75 ton steam**
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***Excellent condition***

**1—12 ton Porter Diesel 1949**
***practically new***

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**INT'L TD-18** cable and hydraulic, 1948
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**LORAIN** 820 Diesel 2 cy Shovel, 1948
**LETOURNEAU** double drum Sheepfoot Roller, excellent
**MACK** 10 cy mod. LFSW Dump Trucks, 1949, Lanova Diesel

**BENDIX MACHINERY CO., INC.**
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16" blade, 5 H.P. motor, good operating condition.

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Equipped with standard boom and handle and heavy 5 cubic yard dipper, now operating on 3 phase, 60 cycles, 4000 volts A.C. but reconnectible to 2300 volts. Close to 20 years old but shut down in winter season. Very well maintained. Located on Iron Range.

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Model 180 Single Pumpcrete
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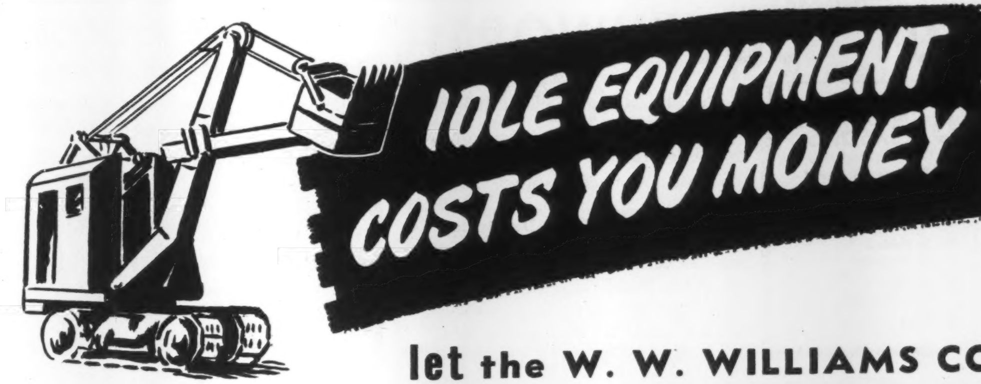

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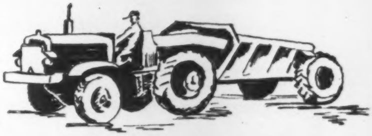

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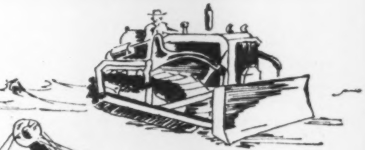

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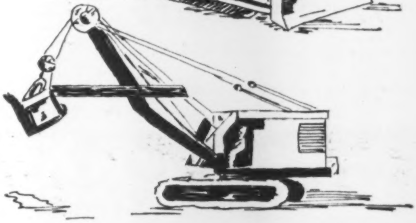

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1—Caterpillar D-8 Tractor, 78" tread, LeTourneau rear winch. Cleaned, painted.

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1. Decade of Service
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## Partial List of Available Machinery

1—**Athey PD10 wagon** for use with DW10, new tires........**$5,450.00**

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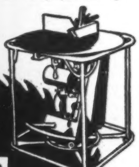

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**Tractor**—Allis-Chalmers Diesel HD14. Wide gauge w/Gar Wood hyd. dozer. Put in good running shape, cleaned, painted. FOB Louisville **$4,250.00**

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● 62" tread, 18" shoes, 6 cyl. engine, no starter, front end pump, with La Plant-Choate hydraulic angle blade, new pins and bushings, 18 new pads. Cleaned and painted. In very good condition. **Evergreen 3-5000**

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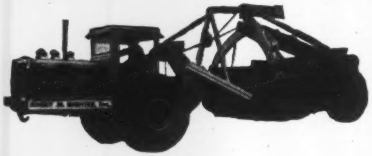

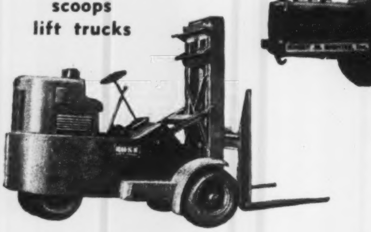

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22" shoes, with La Plant-Choate power control unit, cable bulldozer, canopy, D13000 engine. Cleaned and painted. Recently completely overhauled and not used since. Built originally in 1940. In excellent condition.

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1—½ yd. Insley combination backhoe and shovel

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- 20" shoes, 74" tread, electric starter, standard equipment, and Isaacson hydraulic bulldozer. Cleaned and painted. Mfg. in 1947. In very good condition.

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2 Gaso. Engine Power Units

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2—Euclid Loader—Cummins Diesel
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6—D-8 Caterpillar Tractors. All 1949's and 1951 with DD PCU. 4 have bulldozers
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All of this late model equipment will come to you in A-1 condition; will appear and perform like new. Will consider sale contract on different group units.

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Trucks - Shovels - Gradalls - Cranes and Bulldozers.

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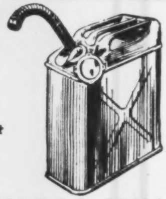

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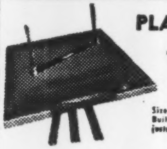

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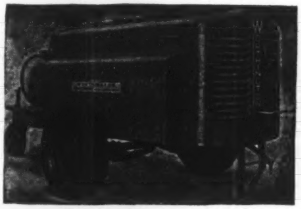

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1100-24 tires, Approximately 20,000 miles
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**FS-9193**, Engineering News-Record
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POSITION OPEN for engineer, construction man familiar with dock and pier building and pile driving who lives in Newark—Elizabeth, N. J. district. Write P-9221, Engineering News-Record.

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MAINTENANCE ENGINEER for Industrial Plant in the Metropolitan Area in Central New Jersey. Salary—Open. Age 25-45. P-9269, Engineering News-Record.

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**SW-8869**, Engineering News-Record
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330 W. 42 St., New York 18, N. Y.

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W-9319, Engineering News-Record
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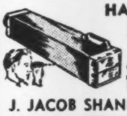

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***SEND COPY TO OFFICIAL PROPOSAL DIVISION, ENGINEERING NEWS-RECORD, 330 W. 42ND ST., NEW YORK 18, N. Y.***

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Bids: April 16, 1951

## Sanitary Sewer System

"Notice is hereby given that sealed proposals will be received by the Township Committee of the Township of Millburn in the County of Essex, New Jersey, for the construction of 15,000 lineal feet, more or less, of eight (8") inch to twenty-seven (27") inch sanitary sewer pipe line, in and through rights of way referred to in an ordinance entitled 'AN ORDINANCE PROVIDING FOR THE CONSTRUCTION OF SECTION NUMBER 3 OF A SANITARY SEWER SYSTEM TO SERVE CERTAIN UNDEVELOPED LAND AREAS IN THE TOWNSHIP OF MILLBURN IN THE COUNTY OF ESSEX AND FOR FINANCING THE COST THEREOF' and crossing Parsonage Hill Road, Great Hills Road, Great Hills Terrace, and Old Short Hills Road, and partly in and through portions of South Orange Avenue and Exeter Road, together with such items of construction incidental to the completion of the project as may be deemed necessary and advisable, and opened and read in public at the Township Hall, Millburn, New Jersey, on Monday, April 16, 1951 at 8:30 o'clock P.M.

"On and after March 26, 1951 plans, specifications and forms of proposal may be examined by prospective bidders at the office of the Township Engineer, Washington School, Township of Millburn, N. J. during business hours.

"Bids must be made on proposal forms to be furnished by said Township Engineer, in the manner designated therein and required by said specifications, and must be enclosed in sealed envelopes, bearing the name and address of bidder and name of the project on the outside, addressed to the Township Committee, Township Hall, Township of Millburn, N. J.

"Each bid must be accompanied by a certified check made payable to the Township of Millburn in the County of Essex, in an amount equal to ten (10) percent of the total of said bid, and also by an agreement in writing by a Surety Company authorized to do business in the State of New Jersey approved by said Township Committee, to the effect that it will furnish the bonds required by the specifications.

"The Township Committee of the Township of Millburn, in the County of Essex, N. J. reserves the right to waive informalities, to reject any or all bids and to accept the bid that in their judgment will best serve the Township of Millburn in the County of Essex, N. J.

THEODORE L. WIDMAYER
Township Clerk."

---

Bids: April 27, 1951

## Filtration Plant Extension

Office of City Purchasing Agent
Nashville, Tennessee.

Sealed bids will be received by the Purchasing Agent of the City of Nashville, Tennessee, at the Office of the Purchasing Agent, until 10:00 A.M., Central Standard Time, on Friday, April 27, 1951, for Filtration Plant Extension, including Six (6) Additional Two and a Third Million Gallon Filters, Chlorine Machine in Storage Room, New Clarifier, New Grit Chamber, New Mixing Chambers, Conversion of Existing Settling Basins to Clarifiers, together with all piping, Valves, Auxiliary Equipment and other appurtenances, in accordance with the plans and specifications which are on file in the office of the Director of the Nashville Waterworks Department, Room 201 City Hall, Nashville, Tennessee, and also the office of The Chester Engineers, 210 East Park Way, Pittsburgh 12, Pennsylvania. Immediately after closing time for the receipt of bids they will be publicly opened and read aloud in the office of the Purchasing Agent, City Hall.

The successful bidder will be required to furnish a satisfactory performance bond.

All bids shall be made upon the blank forms of the contract documents. Copies of all contract documents, including Proposal Form, Contract Plans and Specifications and Instructions to Bidders may be obtained at the office of The Chester Engineers by depositing Twenty-Five Dollars ($25.00) for each set of documents so obtained. The entire deposit will be refunded to each actual bidder and Fifteen Dollars ($15.00) will be returned to all others who return plans and specifications in good condition within ten (10) days after opening of bids.

The right is reserved by the City of Nashville, through its Mayor, to reject any and all bids, to waive any informalities in the bids received, and to accept any bid which, in its opinion, may be for the best interest of the City.

A certified check or bank draft, payable to the City of Nashville, or a satisfactory bid bond executed by the bidder and a surety company authorized to transact business in the State of Tennessee, in an amount equal to Five Per Cent (5%) of the bid, shall be submitted with each bid.

No bid may be withdrawn after the scheduled time for the receipt of bids.

CITY OF NASHVILLE, TENNESSEE
E. B. SMITH
Purchasing Agent.

---

Bids: April 3, 1951

## Collecting Sewer System

Sealed bids will be received by the Commission of Jefferson County, Room 206 Courthouse, Birmingham 3, Alabama, at its office until 10:00 A.M., C.S.T., Tuesday, April 3, 1951, and at that time publicly opened and read, for furnishing the pipe and for constructing collecting sewer systems consisting of approximately 4.3 miles of sewers from 8" to 36" in diameter. The work is subdivided into the following contracts.

CONTRACT A—The work under this contract is for the furnishing of materials and construction of the Bessemer Sanitary Sewer Outfall, consisting principally of the following:

4941 feet 36" V.C. or Concrete Sewer
1798 feet 36" C.I. Sewer
300 feet Steel Truss & Piers
8 Manholes
All miscellaneous construction

CONTRACT B—Furnishing only the items of Sewer pipe listed under contract A.

CONTRACT C—The work under this contract is for the furnishing of materials and construction of the Homewood Griffin Creek Sanitary Sewer Outfall, consisting principally of the following:

3318 feet 12" V.C. or Conc. Sewer
2925 feet 18" V.C. or Conc. Sewer
3714 feet 24" V.C. or Conc. Sewer
4497 feet 27" V.C. or Conc. Sewer
597 feet 30" V.C. or Conc. Sewer
600 feet 12" C.I. Sewer
132 feet 18" C. I. Sewer
414 feet 24" C.I. Sewer
70 Manholes
All miscellaneous construction.

CONTRACT D—Furnishing only the items of Sewer pipe listed under contract D.

Plans, specifications and contract documents are open to public inspection at the office of C. J. Rogers, County Engineer, Room 206, Courthouse, and at the offices of J. W. Goodwin Engineering Co., Inc., 726 South 29th Street, Birmingham, Alabama, or may be obtained from J. W. Goodwin Engineering Co., Inc., upon deposit of $25.00. The full amount of deposit for one set of documents will be refunded (with deductions not exceeding the actual cost of the documents) upon return of all documents in good condition within three (3) days after the date of opening of bids.

A Performance Bond will be required of the successful bidder in the amount of 100% of the contract price. A Labor and Material Bond will be required of the successful bidder in the amount of 50% of the contract price.

Attention of Bidders is called to the License required by Act. No. 297 of General Laws of the Legislature of Alabama, approved September 2, 1935, entitled "An Act to Regulate the Licensing of General Contractors", and that it will be necessary for all persons submitting bids for work involving Ten Thousand Dollars or more to show satisfactory evidence of license as a general contractor. No Plans, specifications or proposal forms herein will be issued to other than licensed general contractors or their authorized agents.

Bids must be accompanied by a certified check or Bidder's Bond in an amount not less than five (5) percent of the base bid.

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of sixty days.

The Owner reserves the right to reject any and all bids, and to waive informalities.

JEFFERSON COUNTY COMMISSION
By: W. D. Kendrick, President
Attest: T. S. Lucius, Chief Clerk
J. W. GOODWIN ENGINEERING CO., INC.
726 South 29th Street
Birmingham, Alabama

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### U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DC-3358) will be received by the Bureau of Reclamation, Denver, Colorado, until April 17, 1951, and then publicly opened for furnishing and installing one electrically operated freight elevator, complete, for Cachuma Project, California. Delivery is desired within 365 days. For particulars, address Bureau of Reclamation, Building 1-A, Denver Federal Center, Denver, Colorado.

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UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3359) will be received by the Bureau of Reclamation, Denver, Colorado, until May 1, 1951, and then publicly opened for furnishing 2 vertical-shaft, 26,500-horsepower, 163.6-rpm hydraulic turbines, complete, for Alcova Power Plant, Kendrick Project, Wyoming. Delivery is desired within 660 days. For particulars, address Bureau of Reclamation, Building 1-A, Denver Federal Center, Denver, Colorado.

(Continued on page 318)

### OFFICIAL PROPOSAL

**RATE:** $1.00 per line (or fraction) per insertion.

**CLOSING DATE:** 3:00 A.M. Thursday for issue out following Thursday.

**SEND COPY:** Official Proposal Division, Engineering News-Record, 330 W. 42nd St., New York 18, N. Y.

# OFFICIAL PROPOSALS

## OFFICIAL PROPOSALS

(Continued from page 317)

Bids: April 11, 1951

### State Road Work

NOTICE TO CONTRACTORS: STATE DEPARTMENT OF PUBLIC WORKS, ALBANY, N. Y.—Pursuant to the provisions of the Highway Law and the Canal Law, and special provisions for projects financed with federal aid funds, sealed proposals will be received until ten-thirty o'clock A.M., eastern standard time on Wednesday, April 11, 1951 by Henry A. Cohen, Director, Bureau of Contracts & Accounts, 14th Floor, The Governor Alfred E. Smith State Office Building, Albany, N. Y., for the following projects: Maps, plans, specifications and proposal forms may be seen and obtained at the office of the State Department of Public Works, Bureau of Contracts & Accounts, Albany, N. Y., and at the office of the District Engineers noted below, and may also be seen at the office of the State Department of Public Works, 270 Broadway, New York City.

The deposit for plans and proposal forms for each contract is indicated below. A refund will be made in full to bidders for the return of one set in good condition within 30 days of award or rejection of bids; refund for all other sets in good condition, similar period, will be 50% of deposit.

| County | Contract No. | Name | Miles | Type | Deposit | Estimated Cost of Work |
|---|---|---|---|---|---|---|
| DISTRICT No. 1 | | | | | | |
| G. L. Nickerson, Dist. Engr., 353 Broadway, Albany N. Y. | | | | | | |
| Schenectady | M-51-2 | Lock No. 7, Niskayuna, N. Y. | | Furnishing & Replacing Lock Gate & Lowering Sill | 5% of Bid<br>Plans $10 | Not Published |
| Schenectady | M-98 | Movable Dam No. 4, Scotia, N. Y.<br>Movable Dam No. 5, Rotterdam, N. Y. | | Furnishing & Replacing Gates & Replacing Substructures | $26,000<br>Plans $10 | $470,627.50 |
| DISTRICT No. 6 | | | | | | |
| H. F. Brumm, Dist. Eng., 30 West Main St., Hornell, N. Y. | | | | | | |
| Yates | FASS51-11 | Red Jacket Bridge-Milo Center, Pt. 1, Co. Rd. No. 105, Proj. No. S(786(2) | 2.85 | Bit. Dble. Surf. Treat. Cr. Stone | $9,000<br>Plans $15 | 165,000.00 |
| DISTRICT No. 8 | | | | | | |
| J. S. Bixby, Dist. Engr., Pleasant Valley Road, Poughkeepsie, N. Y. | | | | | | |
| Columbia & Dutchess | TSP 51-1<br>RC 51-6 | Taconic State Parkway, Sec. 7, Pt. 3; 8; 9 Pt. 1; 9A, Pt. 2; 9B, Pt. 1; (Lake Taghkanic-West Taghkanic, Co. Rd. 12)<br>Rock City-Lafayetteville, S. H. 628<br>West Taghkanic-Ancram, S. H. 9058 | 14.70 | Grading & Structures = 12.35 Mi. Asph. Conc. Ty. 1A, Opt. = 1.97 Mi. 9' Cement Conc. Pavt. 48' Var. Wide = 0.38 Mi. Hy. Sep. Conc. Rigid Frame 50'-7" Span Br. 3 Sp. Alpha I-Beam 1 at 82'-10" and 2 at 80' 11" Hy. Sep. 2 Sp. Conc. Rigid Frame 44'-6" Each Hy. Sep. Conc. Rigid Frame 44'-1½" Span Alpha Royalty = $500.00 | $200,000<br>Plans $100 | 3,835,000.00 |
| Dutchess | FASS51-6 | Stanfordville-Taconic State Parkway, Co. Rd. 19, Proj. No. S342(1) | 4.21 | Bit. Mac. Pen. Method, Type 1 | $15,000<br>Plans $15 | 281,000.00 |
| Orange | RC51-8 | West Point-Central Valley, S. H. 5328-5328A<br>Fort Montgomery-Highland Falls, S. H. 8078<br>Fort Montgomery-West Point Junction, S.H. 8526 | 2.61 | Opt. Guide Railing | $2,500<br>Plans $10 | 45,000.00 |
| Rockland | PIP51-2<br>RC51-10 | Palisades-Interstate Parkway Pt 1 (Rte. 45 to Mt. Ivy) Suffern-Mt. Ivy, S. H. 1448<br>Mt. Ivy-Haverstraw, S. H. 1660<br>Spring Valley-Mt. Ivy, S. H. 1019 | 2.24 Cont.<br>(1.93 Access) | Grading & Structures = 1.48 Mi. 9" Cem. Conc. Pavt. 24', 36' & Var. = 0.76 Mi (Access = Grading & Struct. = 0.80 Mi.; Cem. Conc. Pavt. = 0.21 Mi.; D. S. T. Gr. Grav. = 0.69 Mi. & Asph. Conc. Ty. 1A, Opt. = 0.23 Mi.) 4 Sp. I-Beam 2 at 53'-9" & 2 at 67'-6" | $65,000<br>Plans $25 | 1,167,000.00 |
| DISTRICT No. 10 | | | | | | |
| J. J. Darcy, Dist. Engr., Montauk Highway at Little E. Neck Road, Babylon, L. I., N. Y. | | | | | | |
| Queens | FAVWE51-1 | Van Wyck Expressway, Cont.12,Proj.U1085(13) | 0.48 | 8" & 9" Cem. Conc. Pavt. 2 at 25' Wide = 0.46 Mi.; Misc. Work = 0.02 Mi.; Hy. Sep. Pl. Gird. 83'-7¼" Sp.; Hy. Sep. 2 Sp. I-Beam 43'-4" & 43'-11½"; Hy. Sep. 2 Sp. I-Beam 44'-7" & 45'-3½"; Pedestrian Overpass 2 Sp. I-Beam 49'-3" & 39'-6" | $150,000<br>Plans $100 | 2,751,000.00 |

Proposal for each contract must be submitted in a separate sealed envelope with the name and number of the contract plainly endorsed on the outside of the envelope. Each proposal must be accompanied by draft or certified check payable to the order of "State of New York, Commissioner of Taxation & Finance" for the sum as specified in the advertisement and the proposal. The retention and disposal of the bidding check, the execution of the contract and bonds shall conform to the provisions of the Highway Law, as set forth in "Instructions to Bidders".

When optional types are permitted on contracts with federal funds, bidders must state in the space provided in the proposal the exact designation of the optional type upon which the proposal is predicated.

The right is reserved to reject any or all bids.

B. D. TALLAMY
Supt. of Public Works

*The minute you seal the envelope you seal the verdict...*

NO ONE but a bidder can decide, practically, whether he, or someone else, will be the successful bidder on any contract . . . because it is you — the bidder — who decide what you will charge to do the work. No one can decide that but you. So, you actually "write your own ticket."

NATURALLY, you must deliver certain specified materials and perform definite functions, within a certain time—that much of the job is something over which you have no control. But . . . it is when you begin to plan ways and means of DOING the job that you start to win or lose it. If you can do it more quickly, with less loss of motion, and, possibly, with fewer man-hours to charge against the job—in other words, at a lower cost to you — you will have the "edge" you need to make you the successful bidder.

LOW cost operation is usually the result of a thorough knowledge of the most efficient methods—and the use of modern equipment. You will be well repaid through your reading of ENGINEERING NEWS-RECORD—both editorial and advertising.

(Continued on page 319)

## U. S. Government

(Continued on page 318)

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Specifications No. DC-3348) will be received by Bureau of Reclamation, Palmer, Alaska, until April 12, 1951, and then publicly opened for furnishing labor and materials and performing all work for the construction of 115-kilovolt Eklutna-Palmer transmission line and 12.47-kilovolt distribution line and distribution system of Eklutna Government Camp, Eklutna Project, Alaska. The work is situated about 30 miles northeast of Anchorage, Alaska. The work will consist of approximately 16 miles of 115-kv., 3-phase, wood-pole, H-frame-type transmission line without overhead ground wires; 1 mi. of 12.47-kv., 4-wire, single-wood-pole distribution line; and electrical distribution system for the Government camp. Completion is desired within 170 days. For particulars, address Bureau of Reclamation, Office Building, Palmer, Alaska; or Building 1-A, Denver Federal Center, Denver, Colorado.

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Department of Commerce, Bureau of Public Roads, March 15, 1951. SEALED BIDS will be received at the office of the Division Engineer, Bureau of Public Roads, 1440 Columbia Pike, Arlington, Virginia, until 11:00 a.m., E.S.T., APRIL 17, 1951, for Project 2N5-P4-Q6, Blue Ridge Parkway, from Black Mountain Gap to Route U S 70, Yancey and Buncombe Counties, North Carolina. Approximately 48,500 tons Type H-1 Asphalt Pavement, Liquefier Type, and other work. Length 27.082 miles. Minimum wage rates have been fixed as required by law. For plans and specifications, a deposit of $10.00 cash or CERTIFIED check made payable to the Treasurer of the United States, will be required to insure their return within 15 days after the opening of bids. Plans, specifications, and proposal forms may be obtained at the address given above, or at Bureau of Public Roads, 920 South Jefferson Street, Roanoke, Virginia. H. J. Spelman, Division Engineer.

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## OFFICIAL PROPOSALS

Bids: April 24, 1951

### *Structural Steel and Steel Erection*

FOR
CITY-COUNTY BUILDING
DETROIT-WAYNE JOINT BUILDING AUTHORITY

CONTRACT NO. CC-1

The Detroit-Wayne Joint Building Authority will receive sealed proposals for structural steel and steel erection for the City-County Building, to be located on the east side of Woodward Avenue north of Jefferson Avenue in Detroit, Michigan, until 2:00 P.M., Tuesday, April 24, 1951. All proposals should be endorsed "Proposal for Contract CC-1, Structural Steel and Steel Erection, City-County Building", and addressed to the Detroit-Wayne Joint Building Authority, 404 County Building, Detroit 26, Michigan. Bids will be publicly opened and read aloud at the time above stated, in Room 422, County Building. Any proposals received after the above-mentioned time will be returned to the bidder unopened.

The accepted bidders will be required to furnish satisfactory performance and labor and material bonds.

The work consists of fabricating, delivering, and erecting the steel framing for the proposed City-County Building, including the 20-story courts unit and the 14-story office unit with its link structure of the same height connecting to the courts unit, also steel work for other appurtenant structures, aggregating altogether about 9,000 tons. It is expected that separate contracts will be let for (1) concrete caissons and concrete-framed basement structure outside the areas of the superstructures, also (2) for cellular steel floors, and finally (3) a general contract for all other construction.

The application to the U. S. Department of Commerce, National Production Authority, for authority to commence construction of the building is now being processed, and approval is expected to be received before the date set for opening bids.

The Contract Documents, including Notice to Bidders, Form of Proposal, Form of Contract Agreement, Drawings, and Specifications, may be examined and obtained at the offices of the Architects and Engineers, Harley, Ellington and Day, Inc., 153 East Elizabeth Street, Detroit 1, Michigan, during business hours. A deposit in the sum of $15.00 is required for each set of plans and specifications, to be refunded if plans and specifications are returned without marks or other mutilations within 10 days after receipt of bids.

Proposals must be submitted on forms furnished by the Architects and Engineers, and each must be accompanied by a certified check or a satisfactory bidder's bond in an amount not less than 5 per cent of the total bid price as security for the acceptance of the Contract.

After the scheduled closing time for receipt of bids, no proposal may be withdrawn for at least 30 days.

The Detroit-Wayne Joint Building Authority reserves the right to waive any informality in any bid, or to accept any bid, or to reject any or all bids, should it be deemed for its best interests so to do.

DETROIT-WAYNE JOINT BUILDING AUTHORITY
ALBERT E. COBO, Chairman
CHARLES G. OAKMAN, Commissioner
JESSE ZIEGLER, Commissioner

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Bids: April 3, 1951

### *Collecting Sewer System*

Sealed bids will be received by the Commission of Jefferson County, 210 Court House, Birmingham 3, Alabama, at its office until 10:00 A.M., C.S.T., Tuesday, April 3, 1951, and at that time publicly opened and read, for furnishing the pipe and for constructing a collecting sewer system consisting of approximately 16.9 miles of sewers from 8" to 120" in diameter, and which is subdivided into the following contracts.

CONTRACT A—The work under this contract is divided into four sections. Bidders may submit proposals on any or all sections of the work. The description of the extent of the work under each section is shown below.

Contract A-1 Comprising the lower section of Village Creek Collector, extending from sta. 39+30 on the survey line to sta. 184+04.5 just west of St. Marks Village, and consisting of:
5,355 ft. 10'-0" sewer
8,995 ft. 3'-0" sewer
Village Creek siphon of 260 ft. of 5'-0" and of 7'-6" sewer
100 ft. 5'-0" siphon bypass
Connection to Valley Creek Diversion line
2 transition sections
3 intercepting connections to present sewers including approximately 425 ft. of 18" sewer pipe and 15 ft. of 8" pipe
All miscellaneous construction

Contract A-2 Comprising the middle section of Village Creek Collector, extending from sta. 184+04.5 to sta. 405+06 near the intersection of Tombigbee St. and 40th St. North, and consisting of:
6,930 ft. 5'-9" sewer
7,695 ft. 5'-3" sewer
7,485 ft. 5'-0" sewer
3,145 ft. 4'-9" sewer
200 ft. 5'-9" bypass sewer
4 transition sections
27 intercepting connections to present sewers including approximately 150 ft. of 18" sewer pipe, 335 ft. of 12" pipe, 50 ft. of 10" and 2,320 ft. of 8" pipe
All miscellaneous construction

Contract A-3 Comprising the upper section of Village Creek Collector from sta. 405+06 to sta. 778+32, near Five Mile Creek just north of Meadowbrook Estates subdivision, and consisting of:
2,645 ft. 4'-4" sewer
1,020 ft. 4'-3" sewer
8,370 ft. 4'-0" sewer
1,485 ft. 3'-6" sewer
5,750 ft. 3'-0" sewer
4,000 ft. 2'-9" sewer
7,700 ft. 2'-6" sewer
2,700 ft. 2'-3" sewer
1,900 ft. 1'16" sewer
1,020 ft. 12" sewer
7 transition sections
17 intercepting connections to present sewers including approximately 85 ft. of 18" sewer pipe, 430 ft. of 12" pipe, 715 ft. of 10" pipe and 1300 ft. of 8" pipe
All miscellaneous construction

Contract A-4 Comprising the Valley Creek division line, extending south along the line of Border Street extended, from a connection with the Village Creek Collector just east of Roberts Field to a connection with the present Valley Creek Collector on the property of the A.C.L. R.R. one block east of Fayette St., and consisting of:
7,561 ft. 5'-6" sewer, mainly in tunnel
All miscellaneous construction

CONTRACT B Furnishing precast reinforced concrete pipe or concrete pressure (centrifugal) pipe for Sections 1, 2 and 3 of Contract A.

The approximate quantities of pipe required for the three Sections of Contract A are as follows: 5,355 lin. ft. 10'-0"; 8,995 lin. ft. 8'-0"; 260 lin. ft. 7'-6"; 7,130 lin. ft. 5'-9"; 7,695 lin. ft. 5'-3"; 7,585 lin. ft. 5'-0"; 3,145 lin. ft. 4'-9"; 2,645 lin. ft. 4'-6"; 1,020 lin. ft. 4'-3"; 8,370 lin. ft. 4'-0"; 1,485 lin. ft. 3'-6"; 5,750 lin. ft. 3'-0"; 4,000 lin. ft. 2'-9"; 7,700 lin. ft. 2'-6"; 2,700 lin. ft. 2'-3".

Plans and Specifications are on file and may be examined at the office of Claude J. Rogers, County Engineer, Room 206, Jefferson County Court House, Birmingham 3, Alabama, J. W. Goodwin Engineering Co., Inc., "Management Engineers," 726 South 29th Street, Birmingham 5, Alabama, and at the office of Polglaze & Basenberg, 812 South 27th Street, Birmingham 5, Alabama; and same may be obtained from the office of Polglaze & Basenberg upon deposit of $35.00 per set. The full amount of deposit will be refunded to persons or firms submitting a bid, and all other deposits will be returned (less $20.00 which is actual cost of documents), upon return of all documents in good condition within five days after the date of opening of bids.

Only proposals submitted by bidders duly licensed as required by Act. No. 297, General Laws of Alabama, approved September 2, 1935, will be considered. The attention of all bidders is called to the provisions of State Law governing "General Contractors" as set forth in Chapter 4 of Title 46 of the 1940 Code of Alabama (Sections 65 to 82, both inclusive.)

All bids must be accompanied by cash, bid bond, or a check certified by a responsible bank, in an amount of not less than five per cent (5%) of the aggregate of the proposal; and such deposits shall be attached to the proposals. The payee of such check or the obligee of such bond shall be the Commission of Jefferson County. The maximum deposit by any one bidder need not exceed fifty thousand dollars ($50,000.00). The deposit shall be forfeited in case the Contractor fails to enter into Contract with good and sufficient bonds within 10 days after the Contract has been awarded to him.

The successful bidder will be required to furnish through an authorized agent in the State of Alabama a Performance Bond satisfactory to the Commission in the full amount of the Contract, and a labor and Materials Bond in a sum equal to but not less than one-half (½) of the Contract price.

No bid may be withdrawn after the time for opening bids has passed. The County reserves the right to hold the bids for a period of sixty days after the date of receiving the bids.

The County Commission reserves the right to reject any or all bids or waive any informality in any bid, and to accept any bids considered advantageous to the Commission.

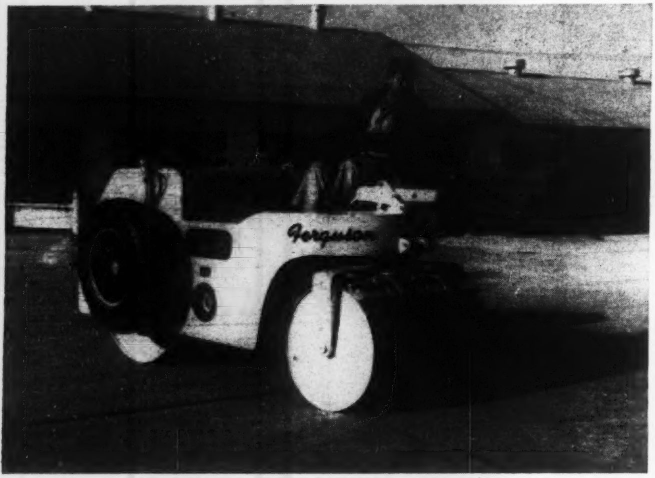
COMMISSION OF JEFFERSON COUNTY
By W. D. Kendrick
President
ATTEST: T. S. Lucius
Chief Clerk

POLGLAZE & BASENBERG, Engineers
812 South 27th Street
Birmingham 5, Alabama

CONTRACTORS WATCH THIS SECTION
for New Projects

Publish your announcements thru the "Proposal Section" of Engineering News-Record and get their bids.

# NEW PRODUCTS



## Maintenance roller has removable rubber wheels

Ferguson 3 to 5 ton maintenance roller is instantly portable on its own wheels. The roller weighs three tons without ballast, and will trail at normal truck speeds. The rubber wheels are raised and lowered by a power-driven hydraulic pump. Towing end of roller is raised hydraulically for attachment to truck. Weight with water ballast is five tons. Forward and reverse movement is controlled by a single lever, with two speeds in each direction. Wheels can be raised 12 in. to permit operation alongside a curb. Or, they can be removed entirely permitting use of the roller alongside a fence or wall. Roller is equipped with 75-gal sprinkling tanks and mats over both rolls. Spring-actuated scrapers are placed at front and back of both rolls. Rear compression roll has a 48-in. dia, and a 42-in. width. Front steering roll has a 30-in. dia, and is 40 in. wide. Power is provided by a 20-hp air-cooled engine.—SHOVEL SUPPLY CO., P. O. BOX 1369, DALLAS 1, TEXAS.

## Wheel-tractor loader

Hydraulic-torque-converter drive and a new-design clutch-type transmission are features of the TL-10 Tracto-Loader. It has a ¾-yd hydraulically controlled bucket, with ample bucket clearance to reach and load average-size dump trucks. Power is provided by an Allis-Chalmers 40.5 brake-horsepower gasoline engine. Weight is 10,650 lb.—TRACTOMOTIVE CORP., DEERFIELD, ILL.

## Masonry waterproofer

Clear silicone-base compound is a water and stain repellent for porous or semi-porous masonry and mortar joints. Cor-O-Pel is said to penetrate to more than ¼ in., and to leave the surface non-glossy and unchanged in color or texture. It can be applied by gun or brush.—CON-COR PAINT CO., 4550 MAIN ST., KANSAS CITY, MO.

## Concrete testing machine

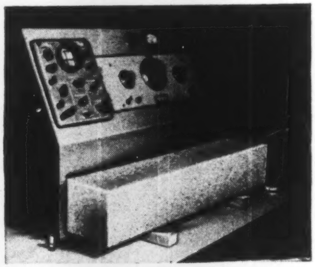
Featuring separate loading and weighing units, this concrete tester has a capacity of 100,000 lb. Two-unit design is said to prevent transmission of load shocks to the indicator and to keep operator out of range of flying or falling particles from breaking specimens. This machine is designed primarily for testing 2-in. cubes and 3x6-in. cylinders. Loading unit has a 17⅝-in. clear space between columns and a maximum opening of 22¼ in. between ram and upper platen. Ram travel is 3 in. at speeds up to 1¼ in. per min. Floor area required by the two units is approximately 70x20 in. Over-all height is 65 in. —BALDWIN-LIMA-HAMILTON CORP., PHILADELPHIA 42, PA.

## Air-cooled diesel engine

Light-duty diesel is available in single or two-cylinder units, having continuous hp ratings of 5.25 and 10.5 at 1,800 rpm. Weight of the Petter AVA single engine is 390 lb.; of the two-cylinder unit, 550 lb. Cooling of the injector nozzle is accomplished by inserting an aluminum-finned sheath between the head and nozzle body.—ABOE, INC., 350 FIFTH AVE., NEW YORK 1, N. Y.

## Hard-facing rod

Oxy-acetylene welding rod is designed for hard facing against medium impact and high abrasion. Wear-Flame "40" consists of wear-resistant chromium-carbides contained in a hard iron-chromium manganese-alloy matrix. Hardness of deposited metal is 56 to 58 Rockwell C. The rod is available in ⅛-in. dia in random lengths, and $\frac{5}{32}$ to ⅜ in. in 14-in. lengths.—ALLOY RODS CO., 7805 W. MARKET ST., YORK, PA.

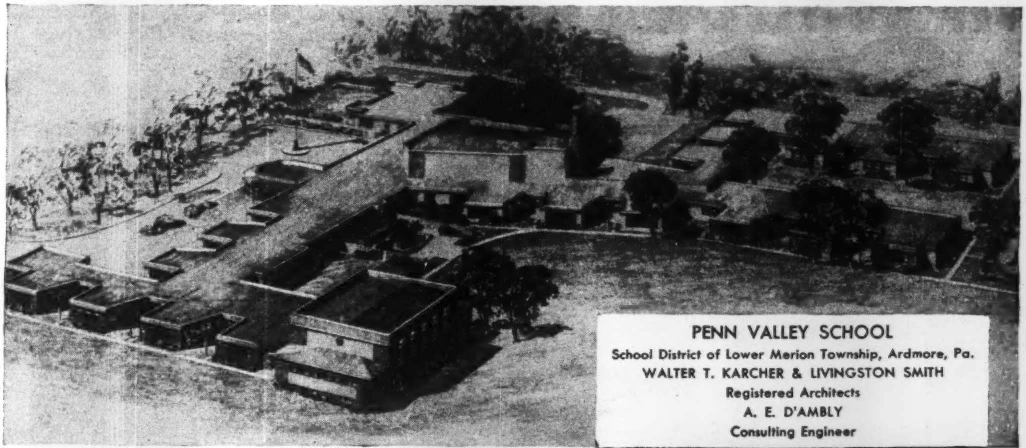


## Meter for elasticity measure

Electro Sonometer for determining resonant frequency of any solid mass is developed from basic designs of the Portland Cement Assn. It consists of two units—the control cabinet and the portable pick-up. Test image obtained on cathode ray oscilloscope is used to determine the flexural and torsional modes of vibration. Infor-

(*Continued on page 323*)

## ANOTHER LESSON IN PREVENTIVE MAINTENANCE



PENN VALLEY SCHOOL
School District of Lower Merion Township, Ardmore, Pa.
WALTER T. KARCHER & LIVINGSTON SMITH
Registered Architects
A. E. D'AMBLY
Consulting Engineer

# BYERS WROUGHT IRON PIPE
safeguards this
# RADIANT HEATING INSTALLATION

To heat the seven-eighths of a mile of interconnected buildings that comprise this new $1,500,000 school, the designers applied modern and functional principles, so apparent in the architectural design, to the heating system with a combination of radiant heating and tempered fresh air. To safeguard the heating installation against excessive maintenance and premature failure, they followed sound, proven practice by specifying wrought iron for the underfloor coils.

One inch Byers Wrought Iron pipe was imbedded in the concrete floor of this extensive one-story, basementless structure. Hot water, with an antifreeze solution, circulated through these pipes, heats the floor which radiates warmth throughout the class rooms. A portion of the installation is shown in the small picture. The pipe was fabricated and installed by Willard Sales & Service, Inc., working in conjunction with National Sheet Metal Company. The latter organization installed the supply ventilation system, under thermostatic control, which provides a dual system of comfort conditioning for the class rooms.

Radiant heating has rolled up an impressive record as an ideal heating system for schools. Byers Wrought Iron pipe is the first choice of experienced engineers for this service because of its unusual combination of advantages. It is readily formed and welded which speeds and simplifies installation. Its emission rate is high. It expands and contracts at practically identical rates with concrete and plaster, and so can be safely imbedded in these materials. It has ample mechanical strength to withstand damage during installation periods. And its corrosion resistance under similar operation conditions has been demonstrated in hundreds of installations, over periods of many years.

Ask for our bulletin, BYERS WROUGHT IRON FOR RADIANT HEATING for the complete story.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.

**WHY WROUGHT IRON LASTS**

This notch-fracture test specimen illustrates the unusual fibrous structure of wrought iron—which is responsible for the unusual corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

# BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON
**WROUGHT IRON**
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

For better service and more economy

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MACWHYTE WIRE ROPES

You'll get maximum service from wire rope that has been specially designed for each job. Over the years, ropes for all types of equipment in every field have been developed by Macwhyte. It will pay you to specify Macwhyte Wire Rope . . . engineered and job-proved for your particular equipment. Recommendations are promptly available from Macwhyte distributors or Macwhyte Company.

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MACWHYTE WIRE ROPE
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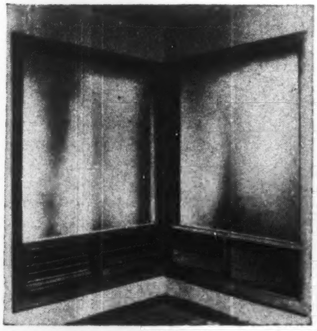
*Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal and Stainless Steel Wire Rope. Catalog on Request.*

mation from these tests can be used to determine Young's modulus of elasticity.—ELECTRO PRODUCTS LABORATORIES, 4501 RAVENSWOOD AVE., CHICAGO 40, ILL.



**Wood-frame window**

Regulated ventilation is the principal feature claimed for the Lilly-Vent window. This is obtained through vertical sliding panels that adjust to any position. Made in standard or custom sizes, these windows are designed for 1-unit installation. They will handle crystal, plate, or double-glazed members.—LILLY-VENT, INC., 7962 S. E. POWELL BLVD., PORTLAND, ORE.

**Rapid metal fastener**

Thumweld device is a permanent fastener for use where rapid assemble or disassemble is important. Or, it can be used to replace screws or bolts securing parts that are occasionally removed for service or inspection. The Thumweld fastener is applied from one side and requires only the drilling of a $\frac{3}{16}$-in. hole. Thumb pressure is sufficient to lock it in place. It is available for attaching plates with a combined thickness of $\frac{1}{2}$ in.—THE AMERICAN SHOWER DOOR CO., 1028 LA BREA, LOS ANGELES 38, CALIF.

**Gas-fired incinerator**

Air-cooled automatic unit is said to completely consume wet or dry garbage and waste material. The combination grate and burner assembly has a series of 30-deg-angle openings that produce a vertical jet flame. Burner is automatically ignited by a pilot light. Circulation is accomplished by a blower that simultaneously mixes cool air with the hot-air exhaust. These incinerators are available in 7 or 15-

(*Continued on page 327*)

**big FEATURES IN MINIATURE**

**..right on your own desk**

Literature describing remarkable features of the new ROGERS Power-Lift Detachable Gooseneck Trailer will be sent upon your request; but—more than that—any Rogers Dealer will demonstrate its features, right on your own desk with an *operating scale model*.

Contact him—see how easily it detaches—how the deck can be raised or lowered to avoid unloading and detouring under certain conditions—how disabled, non-powered equipment can be loaded easily—how the design provides giant tires for extra heavy and profitable payloads.

To buy a trailer without seeing this Rogers unit would be like going to the circus without seeing the elephant. Don't do it.

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*Developed by The Trailer Pioneers*

**ROGERS BROS. CORP.** ALBION PENNA.
135 ORCHARD STREET

Worth its weight

JOHNS-MANVILLE JM PRODUCTS

**Johns-Manville**

# . . . in installation savings

Are you finding it increasingly difficult, in the face of today's economy, to undertake needed water-line construction?

If so, you may find—as other planners do—that Transite* Pressure Pipe can help provide a practical answer to your problem. For this pipe, in addition to its continuing, long-term savings, offers an opportunity for economies in installation *that may go far in helping you contend with rising costs and manpower shortages.*

Transite Pressure Pipe offers a combination of advantages which speed and facilitate water main installations all along the line—from the time the pipe is first received, to final placement of the line in service and restoration of normal street traffic. Not only do pipe laying crews find this modern pipe easy to work with, but its unique features make for a more compact, efficient and economical operation in virtually all the construction phases of water-line extension projects.

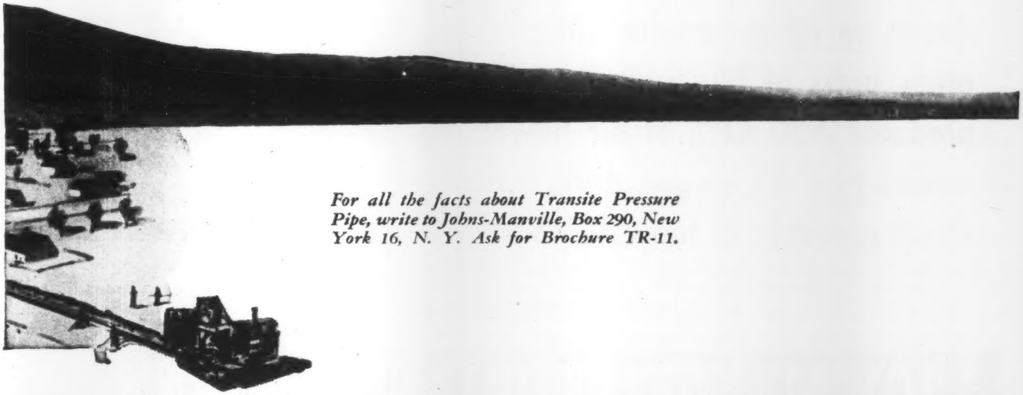
Economies start as soon as a shipment of Transite Pipe is received. Because it is light in weight, unloading and other handling operations are simplified. More footage can be carried per truckload, trucking costs are lowered, and distribution on the job site is faster. And except for the larger diameters of pipe, the sections can be lowered into the trench by hand, or with the aid of rope slings.

Assembly, too, is both rapid and economical. The flexibility of Transite's joints permit the pipe to be laid around wide curves without the need for special fittings. The Simplex Couplings require no calking or hot compounds; they are quickly and easily assembled to provide lastingly tight joints. *And with this pipe you can check for proper assembly immediately after the pipe ends are joined.*

**Makes pipe-laying an assembly-line operation**

This combined feature of rapid assembly and assurance of joint-tightness as fast as the line is laid, is the key to an important Transite advantage: it means that trench excavation, pipe laying, and backfilling operations can follow in quick succession—often under the supervision of one foreman. It makes pipe-laying virtually an assembly-line operation in which the trench can be closed in a minimum of time. This assures more economical use of excavation and earth handling equipment, reduces the expense and hazards of long stretches of open trench, and helps button-up the job with the least possible expenditure of time, labor and money.

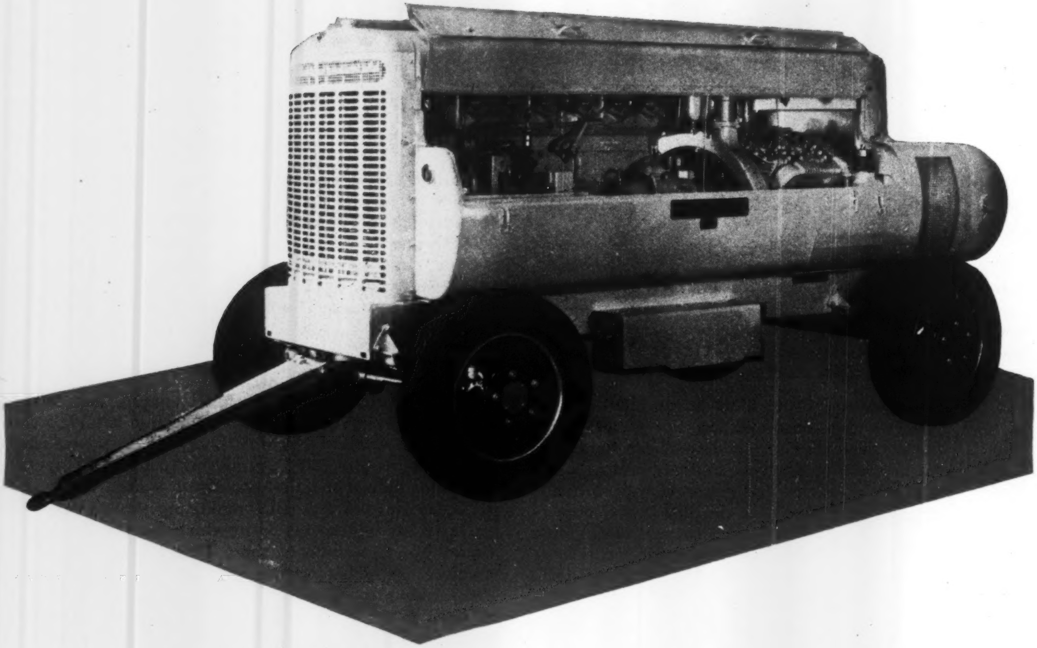
These *initial* savings . . . plus the *long term* economies that have been effected in thousands of installations . . . are two good reasons why you should have the complete story about this modern asbestos-cement pipe developed and produced by Johns-Manville to carry water more efficiently and more economically.



*For all the facts about Transite Pressure Pipe, write to Johns-Manville, Box 290, New York 16, N. Y. Ask for Brochure TR-11.*

# TRANSITE PRESSURE PIPE

Transite is a registered Johns-Manville trade mark



# THE JOY SUPER-PORTABLE COMPRESSOR

**Really portable—smaller than other units of like capacity—produces 630 CFM of air power—runs two 4" wagon drills simultaneously at top efficiency**

*The*
**JOY PORTABLE 630**
*delivers the air—dependably —with low up-keep*
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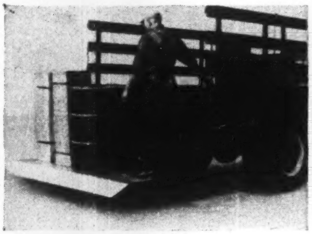
JOY MANUFACTURING COMPANY
GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

bushel capacities.—ABCo Incinerator Corp., Cleveland, Ohio.

### Masonry waterproofer

Silicone-base water-repellent compound is designed for protection of all stone and masonry building materials. It is a liquid, and can be brush or spray applied. Duane No. 923 is colorless, and is said to not change the appearance of the surface to which it is applied. It is available in sizes from 1 gal to 55-gal drums.—Duane Specialties, Ltd., 209 Parkhurst St., Newark 5, N. J.



### Hydraulic tail gate

Frate-Gate has a capacity of 2,000 lb. It is designed to fit all platform, van, or stake-body trucks. A Saf-T-Center control valve automatically stops the gate's travel when operator releases hand pressure. Available in platform sizes from 84x28 to 90x34 in. Mechanically locked when level with the floor of the truck body, it has positive hold in any position.—Gar Wood Industries, Inc., St. Paul Div., 2207 University Ave., S. E. Minneapolis, Minn.

### Window-wall frame

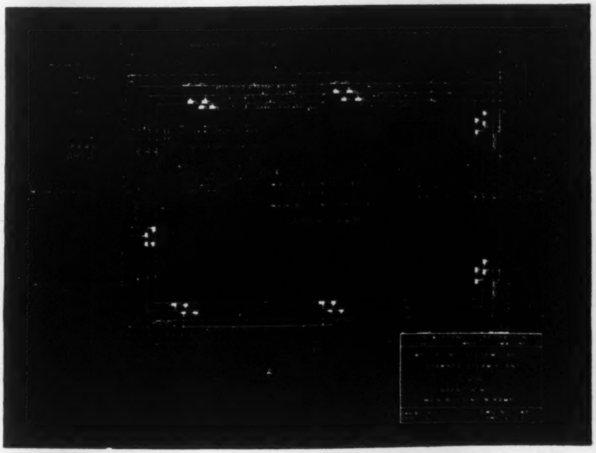
Double-pane window-wall frames are available in standard units in nine sizes shipped knocked down for job assembly. They are designed to accommodate 45½x25½-in. double-pane insulation glass. Sheathing, plastering, painting, and conventional fenestration are not required for installation.—Fabrow Mfg., Inc., Toledo, Ohio.

### Water-treatment units

Packaged water-treatment units are available in sizes ranging from 12 to 1,000 gph. Of the de-ionizing type, larger units are available engineered to meet specific requirements. The series includes six sizes of Illco-Way mixed-bed de-ionizers. These units are said to produce a water containing less than 0.1 ppm total dissolved solids

(*Continued on next page*)

MORE POWER FOR ATOMIC ENERGY!



STANG

DESIGNS, EQUIPS, SUPERVISES PREDRAINAGE SYSTEM FOR

STRATEGIC POWER PLANT

FOR A.E.C.'s U235

ATOMIC ENERGY PLANT

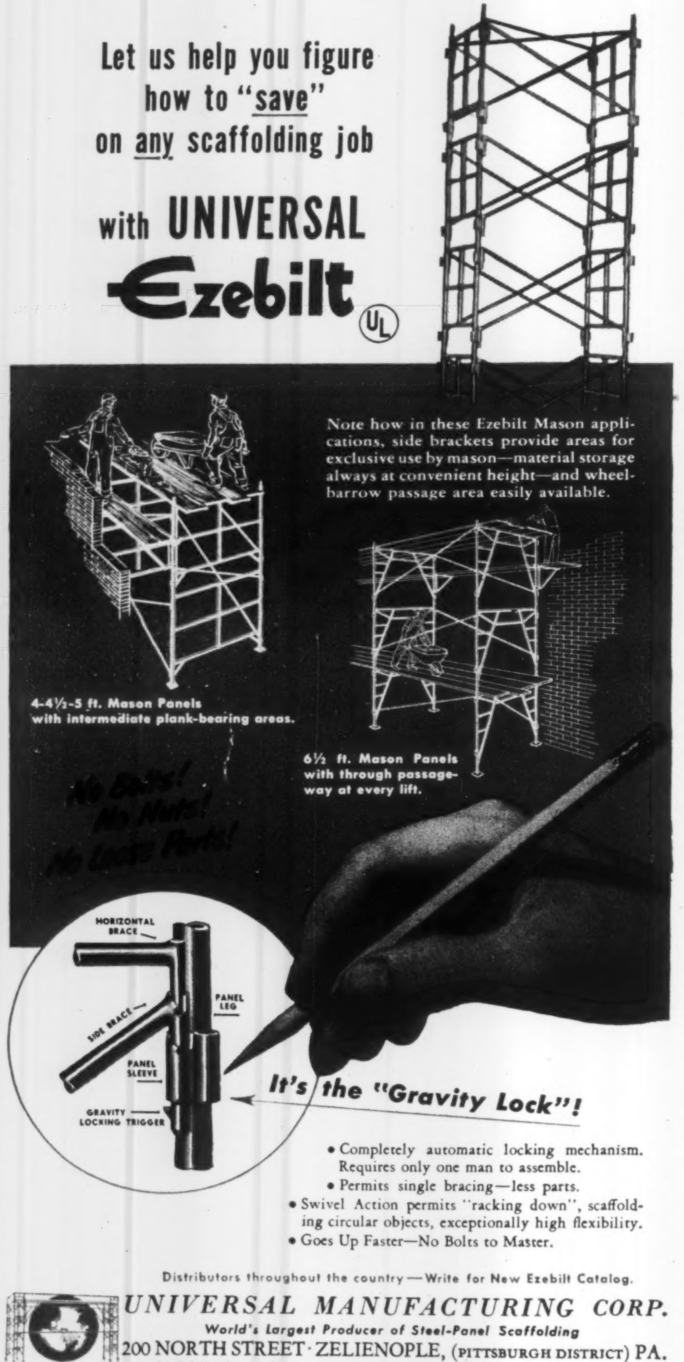
AT PADUCAH, KY.

**This job, a vitally important step in Mobilization, is the Shawnee Steam Plant, and now being constructed by the Tennessee Valley Authority. It involves dewatering 3 construction areas, the area for the main building being 300x600 ft. predrained in 3 stages to a total of 75 ft., or approximately 50 ft. below existing water table. Stang was awarded the contract for designing the dewatering installation, furnishing equipment, engineering supervision.**

- **Stang Wellpoints are used in dewatering all construction including Dams, Power Houses, Sewers, Bridge Piers, Bridges and Culverts, Highways, Industrial Foundations, Airfields, Tunnels, Permanent Installations, etc.**

***Write for catalog. Wellpoint Equipment for Sale or Rent.***

**JOHN W. STANG CORP.**
**2 BROADWAY, NEW YORK 4, N. Y.**
**2123 S. 56TH ST., OMAHA, NEB.**
**8221 Atlantic Ave., P. O. Box 631, BELL, CAL.**


Let us help you figure how to "save" on any scaffolding job

with UNIVERSAL Ezebilt

Note how in these Ezebilt Mason applications, side brackets provide areas for exclusive use by mason—material storage always at convenient height—and wheelbarrow passage area easily available.

4-4½-5 ft. Mason Panels with intermediate plank-bearing areas.

6½ ft. Mason Panels with through passageway at every lift.

No Bolts! No Nuts! No Loose Parts!

It's the "Gravity Lock"!

- Completely automatic locking mechanism. Requires only one man to assemble.
- Permits single bracing—less parts.
- Swivel Action permits "racking down", scaffolding circular objects, exceptionally high flexibility.
- Goes Up Faster—No Bolts to Master.

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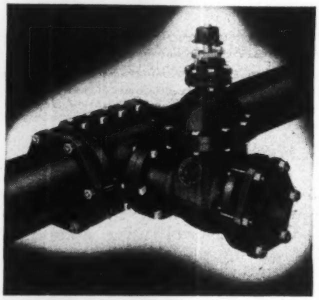
World's Largest Producer of Steel-Panel Scaffolding
200 NORTH STREET · ZELIENOPLE, (PITTSBURGH DISTRICT) PA.
For Tubular Towers Catalog—Write our AMERICAN TUBULAR ELEVATOR CO. DIVISION

with silica less than 0.02 ppm.—ILLINOIS WATER TREATMENT CO., 840 CEDAR ST., ROCKFORD, ILL.

## Arc welder

Selenium-rectifier-type dc arc welder is available in two models—40 to 250 amps and 60 to 375 amps. Features include: Arc start surge; electric current control permitting remote-control operation; no moving parts; instantaneous voltage recovery producing greater arc flexibility; does not require high starting current; quiet operation; and reduced arc blow resulting in no accidental polarity reversal. Standard input requirements are 220/440-v 3-phase 60-cycle current.—MILLER ELECTRIC MFG. CO., APPLETON, WIS.



## Joint-tapping sleeve

Mechanical joint requires only a 10-in. ratchet wrench for complete installation. This stuffing-box-type unit is said to provide bottle-tight joints without stressing flanges or bolts. Rubber side-flange gaskets are molded on a metal backing and require no trimming. The Smith joints are available in sizes ranging from 4x2 to 12x12 for water and gas lines with 0 to 175-lb working pressure. They are fabricated of various materials.—THE A. P. SMITH MFG. CO., 550 N. ARLINGTON AVE., EAST ORANGE, N. J.

## Hydraulic control valve

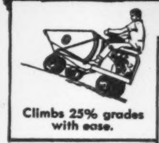
Open-center single-spool three-way valve operates at pressures to 2,000 psi. It features an externally adjustable built-in balanced relief valve sized to handle full pump capacity up to 14 gpm. Pressure drop through the open center is held to 10.25 psi at 14 gpm. In addition to raise, lower, and locked holding position, a float position is also available on special order. Cylinder and pressure ports are available in ¼, ⅜,

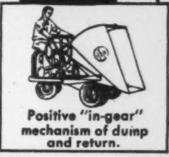
(Continued on page 331)

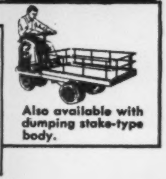
Whiteman Power Buggies are
SPEEDING
ANOTHER BIG JOB
...saving money too!

Speed and economy are more important than ever in these uncertain times. That's why Robt. E. McKee General Contractor, Inc., is using 8 Whiteman Power Buggies to pour 51,000 yards of concrete and rocklite on the big Statler Hotel project in Los Angeles. One Power Buggy does the work of six men with wheelbarrows . . . speeds concrete, sand, brick or mortar over soft earth, up 25% grades, to upper floors, over light scaffolds, through doorways. Carries 12 cu. ft. or 2,000 lbs., yet weighs only 692 lbs. Positive "in-gear" control permits partial or full dumping and return. Travels up to 16 mph. Powered by 7.5 hp, 4-cycle, air cooled engine, has automatic clutch and speed changer. Dependable performance and durability proved over many years. Priced to pay for itself in a short time. Send coupon now for details and name of your nearby distributor.

Power Buggy
Whiteman


Climbs 25% grades with ease.


Positive "in-gear" mechanism of dump and return.


Also available with dumping stake-type body.

**Whiteman**
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**SEND NOW!**

**WHITEMAN MANUFACTURING CO.**
**3249 Casitas Ave, Dept E, Los Angeles 39, Calif.**
Please send me name of distributor, literature and prices on Whiteman Equipment.

Name____________________
Company____________________
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# TWELVE HUNDRED HANDS TO FIND THE FACTS

Four hundred field correspondents ferret out, spade up, shoot in stories from all over the world of industry. Two hundred editors, bristling with Ph.D.'s and practical engineering and scientific knowledge, cull and correct and explain and expound. That's McGraw-Hill.

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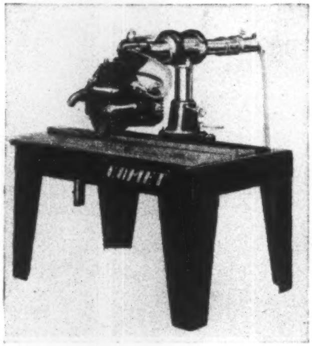
HEADQUARTERS FOR INDUSTRIAL INFORMATION

or ½-in. internal pipe-thread size. Return port is sized at ¾ in.—THE PARKER APPLIANCE CO., 17325 EUCLID AVE., CLEVELAND 12, OHIO.



### Radial power saws

Major design change in the new Comet Clipper is a control for raising and lowering the radial-arm column. This control is now located at the front of the machine just below the work table and folds compactly out of way of the operator. Other changes include: Compact grouping of saw controls; improved heavy-oiled felt wipers enclosed in each end of the bearing housing; and a redesigned blade guard and sawdust chute.—CONSOLIDATED MACHINERY & SUPPLY CO., 2031 SANTA FE AVE., LOS ANGELES 21, CALIF.

### Concrete-floor resurfacer

Improved Armor resurfacing and patching material for concrete floors features a new-type aggregate. Armor is a dry cementatious type powder made up of pulverized pure-oxidizing metal grains and four different kinds of aggregate, chemicals, and puzzolanic ingredients. The new aggregate has an approximate sum of 98% in oxide basilican, iron, and aluminum.—THE MONROE CO., INC., 10703 QUEBEC AVE., CLEVELAND 6, OHIO.

### Heavy-duty motor

Dual-belt variable-speed motor is available with ratings to 50 hp. Autotaut tension control on the Varidrive motors is said to counterbalance belt load. A calibrated spring maintains pressure between the two halves of the driven Varidisks and the sides of the belt.—U. S. ELECTRICAL MOTORS, INC., 200 E. SLAUSON AVE., LOS ANGELES 54, CALIF.

(*Continued on page 333*)

Steel Sheet

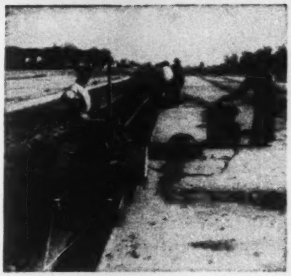
PILING

ROLLED TO SIZE AND SPECIFICATIONS
DELIVERED FROM THE
ARBED
STEEL MILLS
IN LUXEMBOURG

AMERLUX
STEEL PRODUCTS CO.
100 PARK AVE. NEW YORK 17, N. Y.
*Direct Mill Office*

IT'S A MATTER OF RECORD...
*A Dotmar pays for itself in the first mile of paving!*

**On the Eden Parkway, new fast link to Chicago's north suburbs, Robt. A. Anderson & Milburn Bros., Contractors, are paving gutters with a Dotmar Speedmaster Self-Propelled Curb and Gutter Paver at speeds from 5′ to 10′ per minute. There is no other machine like the Dotmar—it's made for these times.**



**At left, Dotmar with outrigger which can be extended 12′6″ to 20′6″. Monolithic curb side of machine runs on form, street side is supported by wheel. It is shown bridging 18′6″ slab—half the width of this street. Burlap being dragged to brush slab. Dotmars pave sidewalks too, up to 60″ wide. Ask for literature.**

Dotmar INDUSTRIES Inc.
500 HANSELMAN BLDG., KALAMAZOO, MICH.

SWING IT! with a MARION
And Get REAL VALUE
in DRAGLINES

● Want to get more for your dragline dollars?

If so, consider what it takes to make a dragline great.

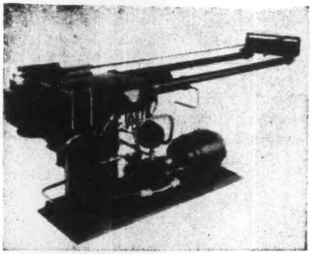
MARION, in more than 65 years of progress, knows there are no substitutes for experienced design, quality materials and careful workmanship if a dragline is to do its job well and faithfully over the years.

MARION builds draglines to **do a job**—not just to "get by" or to "meet a price." MARION builds a size and type to meet every need.

Let your nearest MARION Sales Representative or Distributor show you how easy it is to own today's outstanding Dragline Value.

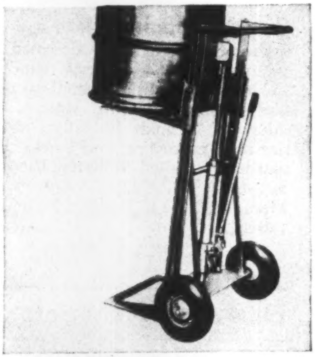
**MARION** POWER SHOVEL CO.
MARION, OHIO, U. S. A.
OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

from [illegible] cu. yd.
to [illegible] cu. yds.



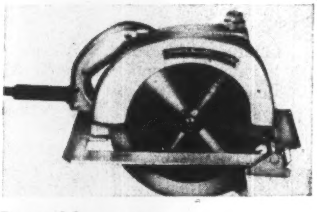
### Hydraulic pipe bender

Compact bending machine is powered by a 2-hp motor. It is operated by a single lever that causes the bending arm to swing around to the degree of bend selected. Bending die is held on by spring clips, for easy changing. Bends can be made to either the right or left. Weight of the Model 800 is 900 lb.—WALLACE SUPPLIES MFG. CO., INC., 1300 DIVERSEY PARKWAY, CHICAGO 14, ILL.



### Dual-purpose hand truck

Built-in hydraulic hoist permits use of hand truck in loading and unloading heavy cases and barrels. Hoist has a capacity of 500 lb., and will lift to a tail-gate height of 54 in. Platform measures 22x19 in.—CLARK-HOPKINS EQUIPMENT CORP., PHILADELPHIA 23, PA.



### Portable power saws

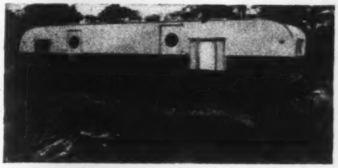
Four new models have been added to the Tools for Industry line. They

(*Continued on next page*)

• Contractors & Engineers
FIELD OFFICE TRAILER

Modernize your field office with latest and up to date office trailer—designed to meet your requirements.

Model #10 29' overall, $2795 f.o.b. Balto.
with toilet and lav., $2995 f.o.b. Balto.



Model #20 35' overall, $3295
With toilet and lav., $3495

Spec. each trailer—Natural beautiful burch finish—drafting table, 8'x3'-6"—8 letter files built in—8 drawers—cabinets—one closet—heated with oil stove—insulated—electric lights—wired for 2 telephones—2 rooms.

TRAILER VILLAGE, INC.
8645 Pulaski Highway
Balto, 21, Md.
Phone Essex 2233

Please send me office trailer plan Model No. .... and pictures of interior.

Name ..............................

Firm Name ..............................

Address ..............................

TERRAZZO in action

For Stepped-Up Endurance: Terrazzo

*Write for free AIA Kit, the complete reference work about TERRAZZO*

• Steps go up—upkeep costs stay down—when TERRAZZO is underfoot. Constant friction of heavy traffic serves only to mellow the marble-hardness. Available for floors, stairs, wainscots and walls, TERRAZZO is sanitary, easy-to-clean, and concrete-durable.
Specify TERRAZZO—in virtually any color-or design-combination—and do your client a permanent service!

SEE OUR CATALOG IN SWEET'S

THE NATIONAL TERRAZZO AND MOSAIC ASSOCIATION, INC.

711 14th Street, N. W. Dept. E Washington 5, D. C.

Baker Bulldozer*
Baker Gradebuilder*

BIGGER EARTH-MOVERS

Baker Root Ripper*

...for your new, more powerful A-C ALLIS-CHALMERS Tractors

**Power...Weight...Balance...**

There's one sure way to make these advantages on your new and more powerful Allis-Chalmers Tractor *pay double* on earth-moving jobs.

And that is to specify Baker Bulldozers, Gradebuilders and Root Rippers—for *exclusive* Baker features enable you to use far more of the *tractor power for PUSH.*

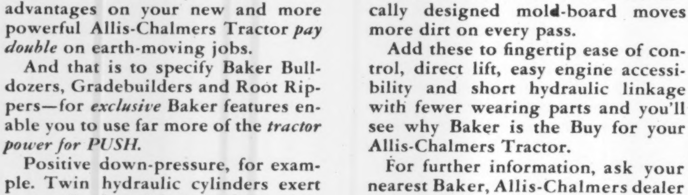
Positive down-pressure, for example. Twin hydraulic cylinders exert an equalized *straight-from-the-shoulder* pressure that forces the blade down until virtually the entire weight of the tractor rests on the cutting edge.

And the roll-action of the scientifically designed mold-board moves more dirt on every pass.

Add these to fingertip ease of control, direct lift, easy engine accessibility and short hydraulic linkage with fewer wearing parts and you'll see why Baker is the Buy for your Allis-Chalmers Tractor.

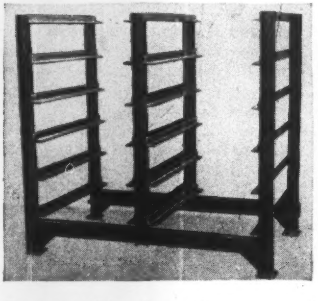
For further information, ask your nearest Baker, Allis-Chalmers dealer for a copy of the new catalog, Bulletin No. 894 . . . or write direct to: THE BAKER MANUFACTURING COMPANY Springfield, Illinois.

***Baker—first again—with Engine-Mounted Hydraulic Advantages**



**P.S.: Baker is the PIONEER and the SPECIALIST in bulldozers**

are: Model 700 Builders Special power saw with a $6\frac{3}{8}$-in. blade for $2\frac{1}{16}$-in. cuts; the Model 800 with 8-in. blade for $2\frac{5}{8}$-in. cuts; the Model 905 with an 8-in. blade for $2\frac{5}{8}$-in. cuts; and the Model 1000 with $9\frac{5}{8}$-in. blade for $3\frac{7}{16}$-in. cuts.—CUMMINS PORTABLE TOOLS, DIV. OF CUMMINS-CHICAGO CORP., 4740 N. RAVENSWOOD AVE., CHICAGO 40, ILL.



### Cement-block rack

Special-type rack is designed to eliminate individual block handling and to make multiple handling practical in drying, curing, storing, and shipping. It holds 12 pallets of the size used for casting four blocks. Bottom level is raised to permit handling by fork-lift trucks. — EQUIPMENT MFG., INC., 21550 HOOVER ROAD, DETROIT 5, MICH.

## New Product Briefs

**Fluorescent light bulb** with screw-in base fits standard lamp sockets. The Lite-Mite is a product of: Stocker & Yale, Marblehead, Mass.

**Extra-long staples** for attaching copper and brass tubing accommodate $\frac{3}{8}$ or $\frac{1}{2}$-in. nominal sizes. Made of copper, they have steel cores for strength. Tube-Tite staples are fabricated by: E. H. Titchener & Co., Binghamton, N. Y.

**Oil-filter cartridge** fits V-type 4-cyl Wisconsin air-cooled engines. Micro-Fine cartridge was developed in collaboration with Wix Accessories Corp.

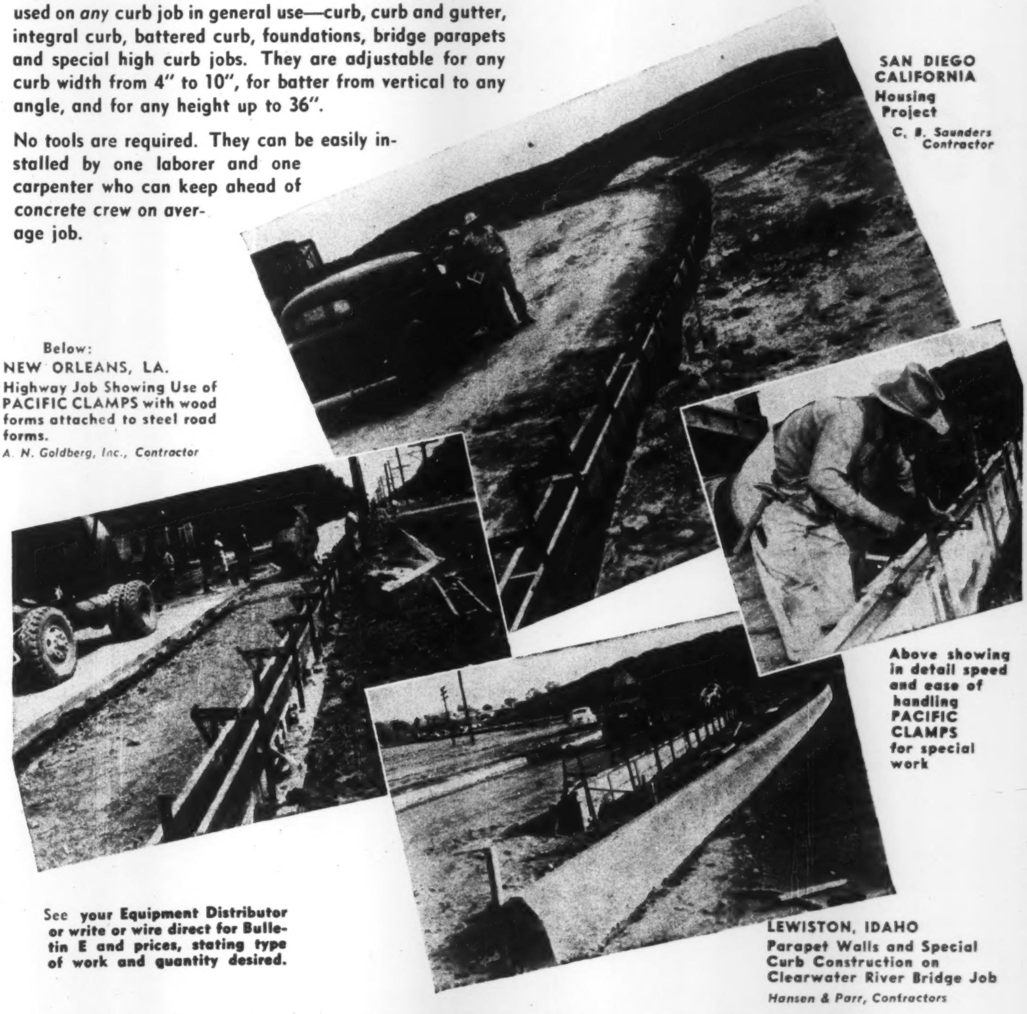
**Square ceiling outlet** for air-conditioning systems is designed and sized to match standard acoustical tile. Another model has surface flange for installation in plaster ceilings. Uni-Flo outlets are produced by: Barber-Colman Co., Rockford, Ill.

# Solve Your Curb, Integral Curb and Curb and Gutter Problems With PACIFIC All-Steel CLAMPS

Used with wood curb forms, these ingenious 2-piece, self-locking, all-steel form clamps reduce nailing to a minimum and save lumber. One set of PACIFIC All-Steel CLAMPS adjusted for the required width, batter and height can be used on *any* curb job in general use—curb, curb and gutter, integral curb, battered curb, foundations, bridge parapets and special high curb jobs. They are adjustable for any curb width from 4" to 10", for batter from vertical to any angle, and for any height up to 36".

No tools are required. They can be easily installed by one laborer and one carpenter who can keep ahead of concrete crew on average job.

PACIFIC CLAMPS assure *more work* out of skilled labor, *better work* out of unskilled labor. They afford all the advantages of steel, plus the low cost of wood.



**SAN DIEGO CALIFORNIA**
**Housing Project**
*C. B. Saunders Contractor*

Below:
NEW ORLEANS, LA.
**Highway Job Showing Use of PACIFIC CLAMPS with wood forms attached to steel road forms.**
*A. N. Goldberg, Inc., Contractor*

**Above showing in detail speed and ease of handling PACIFIC CLAMPS for special work**

**See your Equipment Distributor or write or wire direct for Bulletin E and prices, stating type of work and quantity desired.**

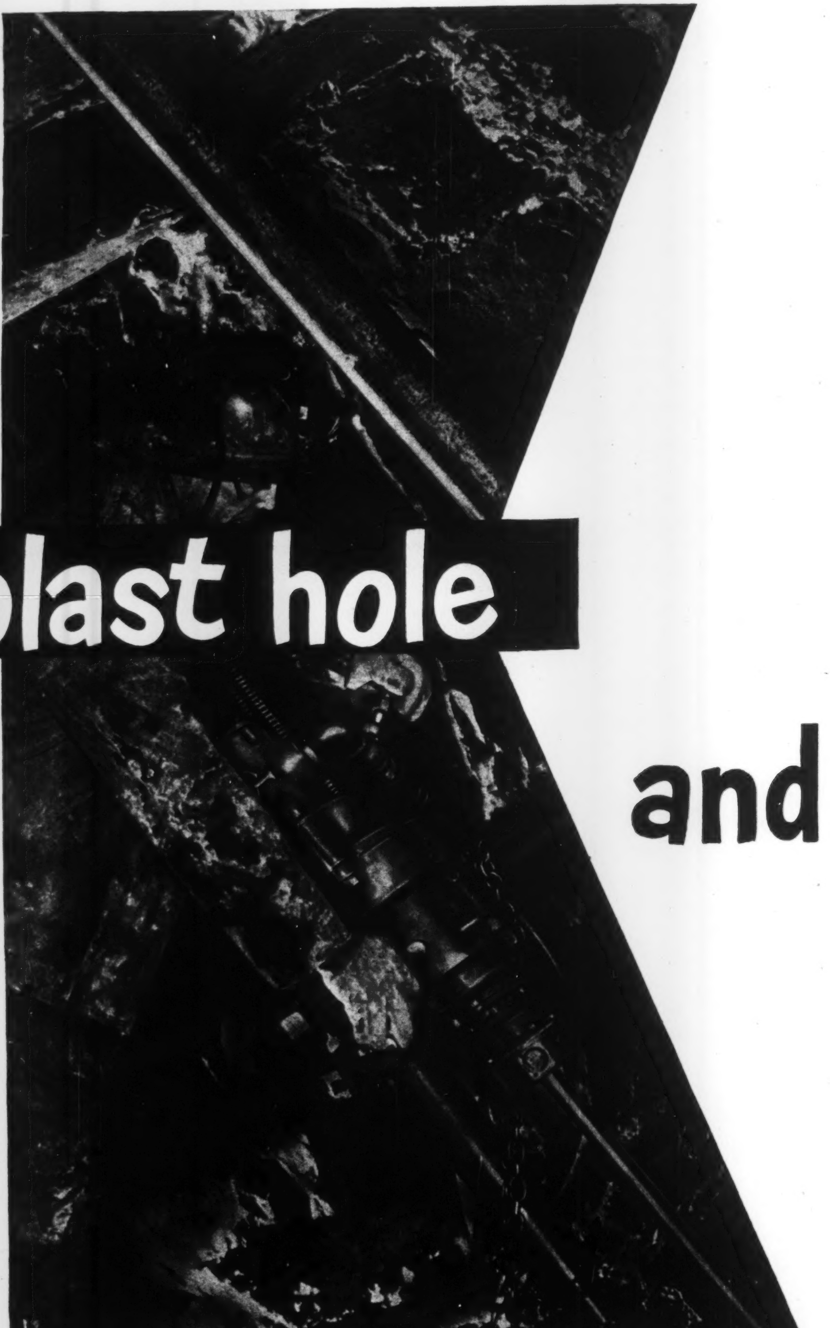
LEWISTON, IDAHO
**Parapet Walls and Special Curb Construction on Clearwater River Bridge Job**
*Hansen & Parr, Contractors*

## PACIFIC ENGINEERING SALES CO.

**215 West Fifth Street** **Los Angeles 13, California**

for

**blast hole**


CP-55 DIAMOND DRILL

and

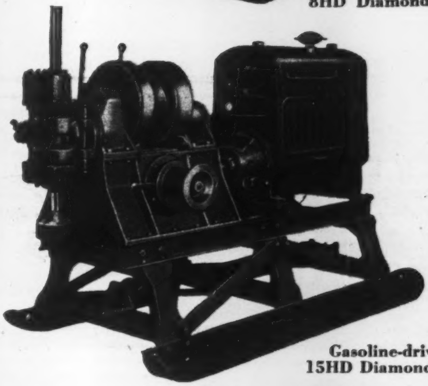
Gasoline-driven CP No. 8HD Diamond Core Drill

Built for exploratory drilling from the surface, the gasoline-driven, skid-mounted CP No. 15HD and No. 8HD DIAMOND CORE DRILLS are readily moved from hole to hole under their own power.

Both are specifically designed for engineer's test borings, mineral prospecting and shallow oil structure drilling. Operating at the continuous high speed made possible by bortz bits, they give exceptional performance with remarkably low maintenance.

CP No. 15HD, with E-EX fittings, has a capacity of 2250 feet; CP No. 8HD, a capacity of 1250 feet. Both are also available with electric or Diesel drive, and with hydraulic head in place of screw feed.

*Write for Bulletin 313*



Gasoline-driven CP No. 15HD Diamond Core Drill

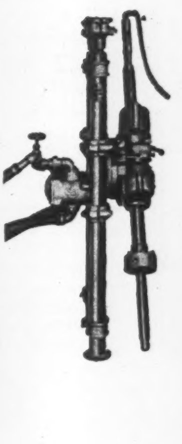
# exploratory drilling

## CP-55—FASTEST DRILL IN ITS CLASS

—designed around the improved CP Rotary Air Motor—the fastest, most powerful rotary motor on a diamond drill. For underground blast hole and exploratory drilling, the CP-55 DIAMOND DRILL is easy to handle; weighs only 160 pounds; requires a minimum amount of air per foot drilled.

Conservatively rated at 500 feet with E-EX fittings. Equally efficient for coring, non-coring or blast hole operations.

*Write for Bulletin 318*



Double-column mounted CP No. 12 Diamond Core Drill

Designed for underground use, the air-driven CP No. 12 DIAMOND CORE DRILL has a double-column mounting. Powered by a CP 25 h.p. rotary twin-air motor, it gives the same excellent performance as all other CP Diamond Drills. Its capacity, with E-EX fittings, is 1250 feet.

Motor, column and swivel head are readily dismantable for convenient underground transportation to "hard to get at" places.

*Write for Bulletin 313*

**CHICAGO PNEUMATIC TOOL COMPANY**

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## MANUFACTURERS' PUBLICATIONS

**Prestressed concrete pipe**—Folder features a description of the construction of prestressed concrete steel-cylinder pipe. Special emphasis is placed on an explanation of how the steel cylinder and concrete core are prestressed to form an elastic structure. Photographs show steps in the manufacturing of the pipe. Also listed is a series of advantages claimed for this type of construction.—PRICE BROS. CO., 1932 E. MONUMENT AVE., DAYTON 1, OHIO.

**Oil burners**—Booklet features selector chart and listing of specifications and capacities of a complete line of oil-burner equipment. This includes: Fully automatic horizontal rotary types, steam-turbine-driven types, combination gas-oil types, semi-automatic types, and pressure atomizing types. Operation and control of each unit is described in detail.—RAY OIL BURNER CO., 401 BERNAL AVE., SAN FRANCISCO 12, CALIF.

**Payroll machines**—Three folders describe how to solve payroll problems by use of machine-accounting procedures. Folder AB-525 entitled "One Fast Line of Writing Completes Your Paycheck and All Your Pay Records" describes timely short-cuts in payroll methods. Folders AB-446 and AB-447 provide supplementary information on the subject of payrolls.—REMINGTON RAND INC., 315 FOURTH AVE., NEW YORK 10, N. Y.

**Soil-testing equipment**—Twelve-page Catalog 3-51 describes a complete line of soil-testing apparatus. Included are: triaxial and consolidation apparatus and accessories, paraffin warmers, dispersion mixers, direct shear apparatus, laboratory and field California bearing ratio apparatus, humidifiers, humid boxes, the Terzaghi water level for differential settlement observations, classifications sets, a portable indicating pyrometric controller, the Harvard miniature compaction apparatus, and laboratory timers.—SOIL TESTING SERVICES, INC., 4520 W. NORTH AVE., CHICAGO 39, ILL.

**Frame construction**—Two new charts illustrate graphically the principles of proper frame construction. The charts measure 3x4 ft, and when placed side by side, require a 4x6-ft wall space. The charts feature a description of eleven major construction details, ex-

(*Continued on page 341*)

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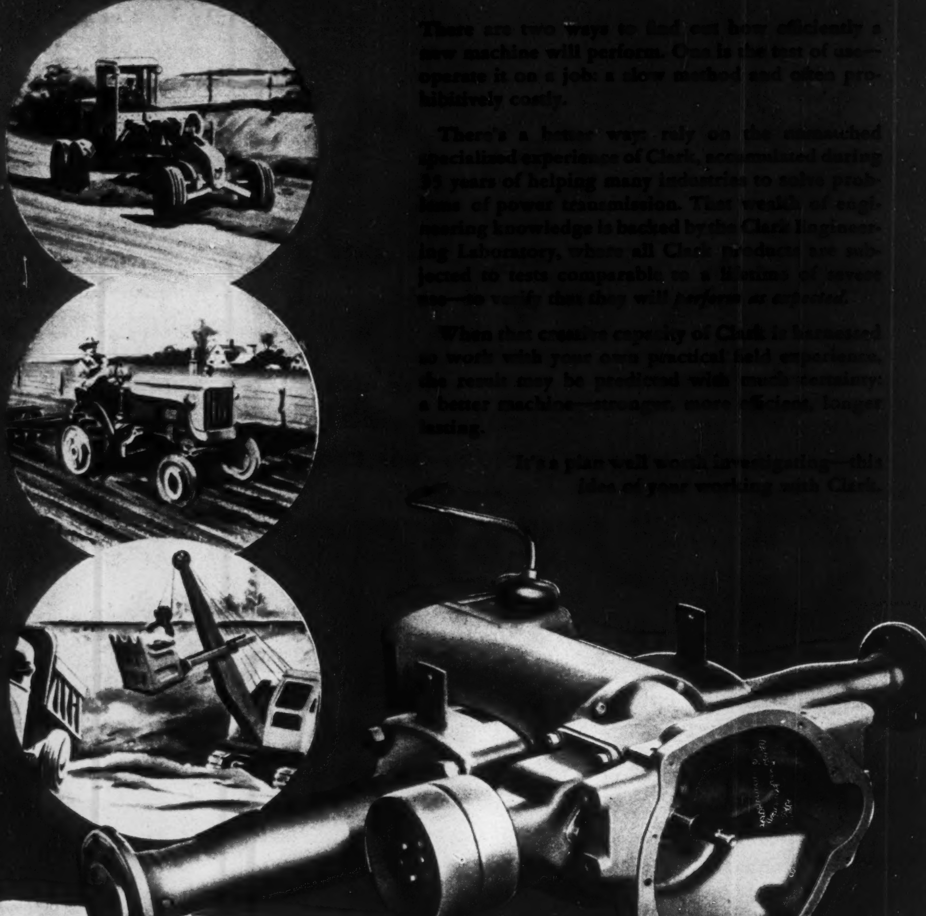

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**Water filters**–Compact self-cleaning filters are described in this six-pager. Featuring a description of the Model SC, the bulletin shows several typical installations, and includes prints showing arrangements of necessary piping. Full specifications are listed. —Sparkler Mfg. Co., Mundelein, Ill.

**Aluminum bridge railings**–Manual is designed to answer engineering questions regarding the use of aluminum for bridge railings. It analyzes advantages of aluminum, and presents typical designs to show its possibilities in the bridge-railing field. Complete stress analysis data are included, as are relative costs. Also covered are design details, methods for assembly, and surface treatment.—Reynolds Metals Co., 2500 S. 3rd St., Louisville, Ky.

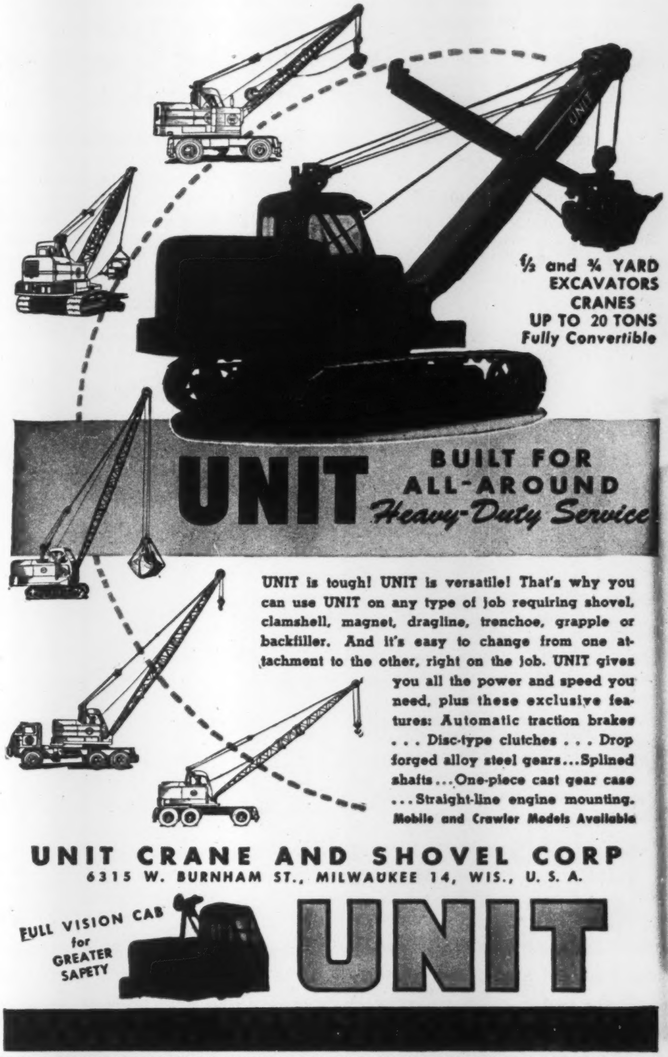
**Diesel engines**–Construction and operation features of the Type 4FS diesel engines are contained in Bulletin 183. This bulletin illustrates various engine applications and gives kilowatt ratings and pumping capacities of the different models. It also pictures all main engine parts and gives their particular specifications.—Nordberg Mfg. Co., Chicago & Oklahoma Aves., Milwaukee 7, Wis.

**Jacks**–Bulletin 1515 (16 pp) describes the Buda line of ratchet, screw, and hydraulic jacks. These jacks are available in a capacity range of 3 to 75 tons. Feature of the catalog is the table of contents which lists jack models by industries. Also included is a table to help select the correct jack, applications pictures, recommended uses, special features, and detailed specifications.—The Buda Co., Harvey, Ill.

**Brushes**–Catalog 210 contains 76 pages of photographs and descriptions of a complete line of power, paint, varnish, and maintenance brushes. The catalog describes the various materials used in producing brushes, tells how to select the proper brush for specific jobs, and shows the various brushes in use, illustrating recommended applications.— The Osborne Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

**Permanent timber bridges**–Advantages and features of timber bridges are described in this 6-p folder. These include deck arch, girder, bowstring

*(Continued on next page)*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**Architectural plywood**—Manual describes ¾-in. Weldwood plywood. It contains valuable reference information on types, characteristics, and uses of this material. Data are provided on how to make corners, joints, curved panels, and counterfront layouts. Charts list availability, origin, and length range of 36 veneers.—UNITED STATES PLYWOOD CORP., 55 W. 44TH ST., NEW YORK 18, N. Y.

**Flange, coupling selector**—Slide-rule-type selector contains all relevant facts for selecting proper flanges and couplings. For flanges, it lists outside diameter, thickness, outside diameter of raised face, number of holes, diameter of holes, diameter of bolts, and bolt circle for Series 15 and 30 flanges. For couplings, it lists average sizes of standard, extra heavy, 3,000, and 6,000-lb couplings. A pipe standard table is incorporated in the selector. It shows nominal wall thicknesses for Schedules 10 to 160, and nominal thicknesses and weights for standard, extra heavy, and double-heavy pipe.—NOOTER CORP., 1400 S. 2ND ST., ST. LOUIS 4, MO.

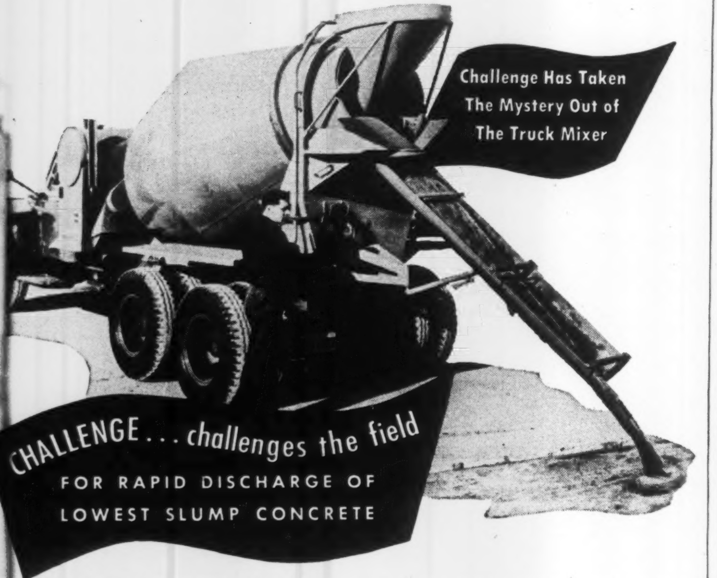
**Wall-form construction**—Enlarged, completely illustrated catalog describes Uni-Forms and the Uni-Form system of wall-form construction. The catalog illustrates several applications showing these forms in use on every type of concrete-forming work.—UNIVERSAL FORM CLAMP CO., 1428 N. KOSTNER AVE., CHICAGO 51, ILL.

**Air-entrainment tester**—Chart used in conjunction with the Press-Ur-Meter speeds the testing of air-entrained concrete. This chart permits a rapid determination of the specific gravity and moisture content of aggregates. The Press-Ur-Meter is a pressure-type air meter for testing air-entrained concrete.—CHARLES R. WATTS & CO., 4121 SIXTH AVE., N. W., SEATTLE 7, WASH.

**Interior lighting**—Booklet (16 pp) describes various types of interior lighting. These include indirect, semi-indirect, direct-indirect, and direct. Shielding mediums, lamp sizes, and suspension methods are given in Booklet B-5254 for each type, and suggested uses are listed as a guide in selecting the best type for a particular purpose.—WESTINGHOUSE ELECTRIC CORP., 306 FOURTH AVE., PITTSBURGH 30, PA.

**Moisture meter**—Bulletin 1295 (6 pp) describes the Tag midget moisture meter designed for instantly determining the moisture content of wood, lumber, plaster, and wood products. The booklet describes the principles of operation of the meter, and explains in detail how it is used.—TAGLIABUE INSTRUMENTS DIV., DEPT. 67, WESTON ELECTRICAL INSTRUMENT CORP., 614 FRELINGHUYSEN AVE., NEWARK 5, N. J.

**Zonolite insulations**—Illustrated booklet (12 pp) explains the proper application of all forms of Zonolite vermiculite. Design data, methods, and specifications outlined are results of laboratory research and field tests. The booklet describes installation methods of insulation fill, plaster aggregate, plaster finish aggregate, acoustical plastic, concrete aggregate, and insulating plastic.—ZONOLITE CO., 135 S. LASALLE ST., CHICAGO 3, ILL.



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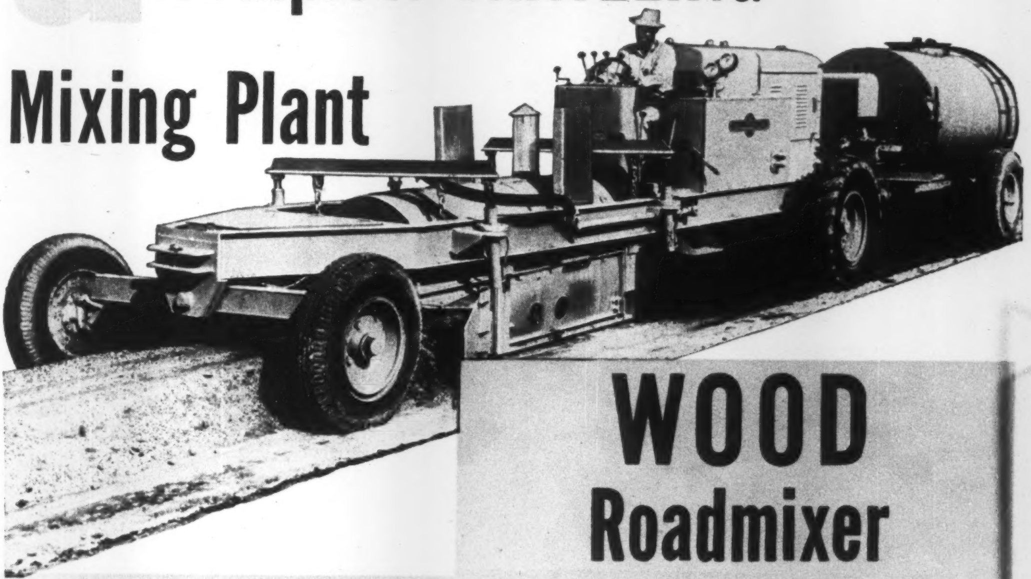

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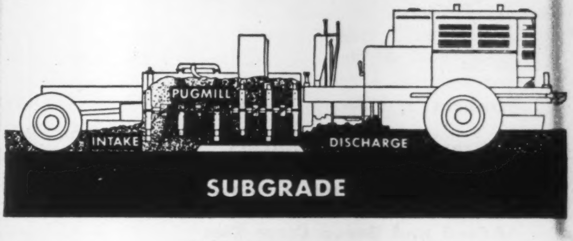

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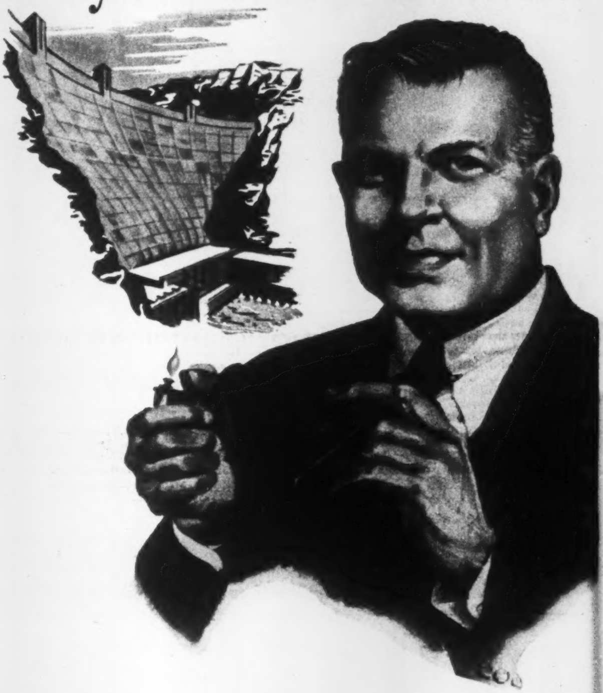

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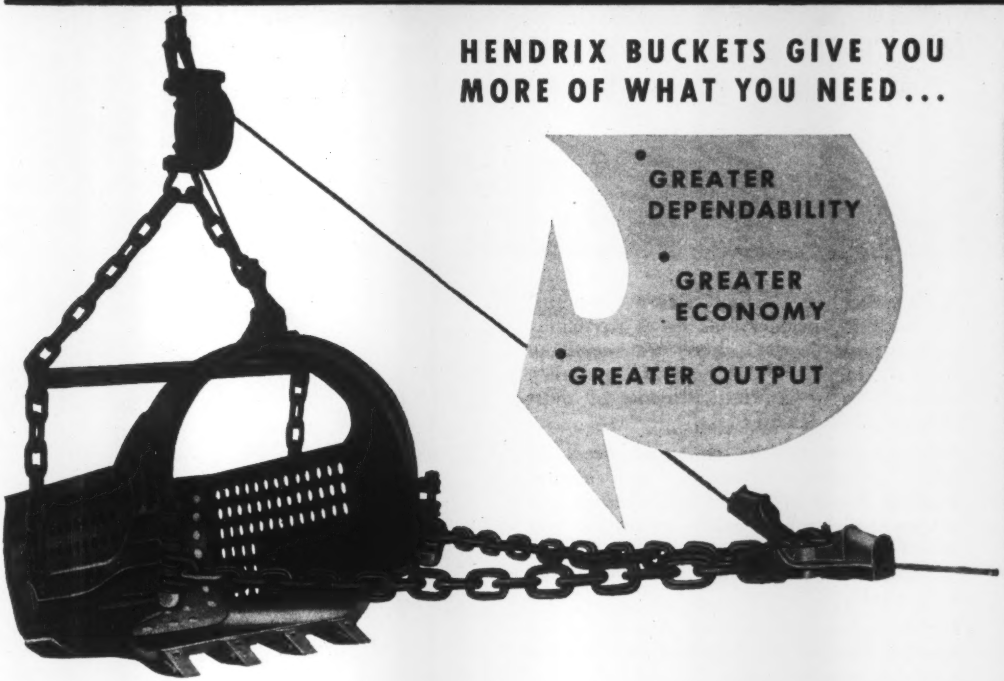

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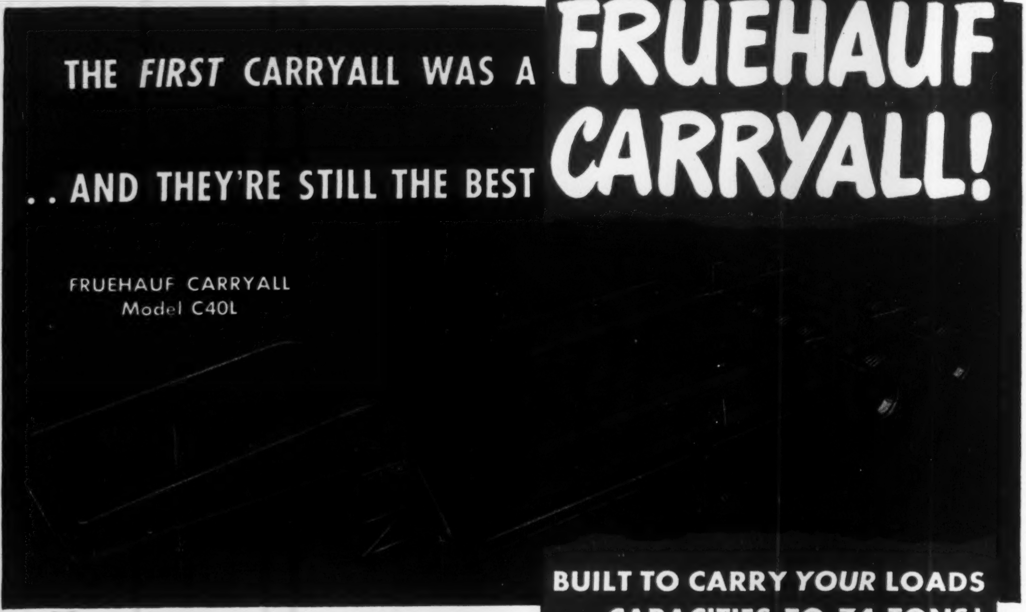

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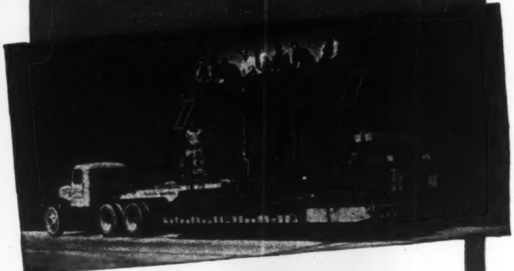

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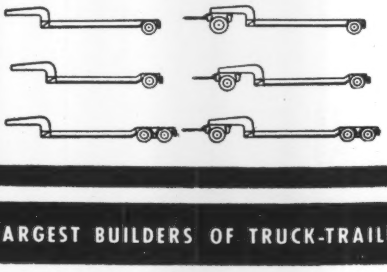

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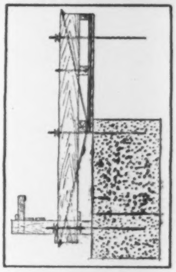

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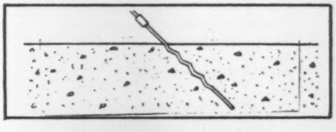

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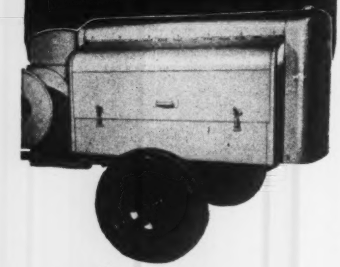

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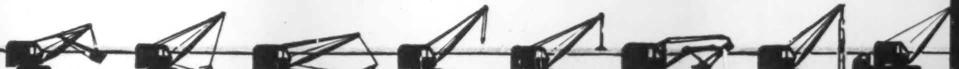

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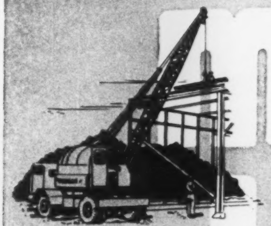

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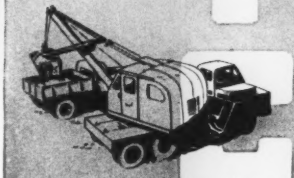

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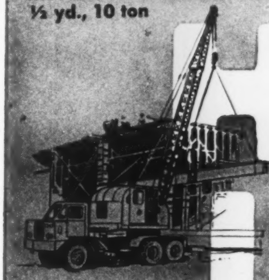

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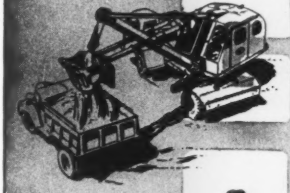

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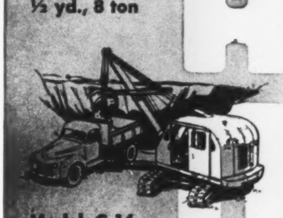

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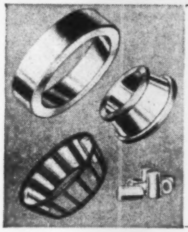

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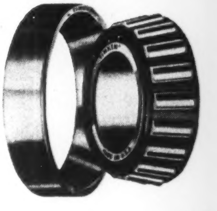

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